TRAINING & PERSONNEL SYSTEMS TECHNOLOGY
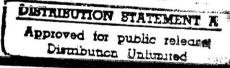
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R&D PROGRAM DESCRIPTION
FY96

NOTICE

These pages amend the FY95 edition of the
Training and Personnel Systems Technology (TPST)
R&D Program Description issued in August 1994

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TRAINING AND PERSONNEL SYSTEMS TECHNOLOGY PROGRAM

R&D PROGRAM DESCRIPTION
FY95/96

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List of Abbreviations Used in Funding Tables

Variable Name	Abbreviation	Used For
CONGRESSIONAL CATEGORY	HF	Human Factors
	MP	Manpower and Personnel
	TS	Training Systems
BUDGET CATEGORY	6.1	Basic Research
	6.2	Exploratory Development
	6.3	Advanced Development
	6.4	Engineering Development
DoD ORGANIZATIONS	ARMY	Army
	NAVY	Navy
	MC	Marine Corps
	AF	Air Force

TABLE II-1

TPST PROGRAM FUNDING 1996
BASED ON FY96 PRESIDENT'S BUDGET

BUDGET CATEGORY BY DOD ORGANIZATION

1995 (MILLIONS)

DOD ORGANIZATION	BUDGET CATEGORY				
	6.1	6.2	6.3	6.4	TOTAL
ARMY	5.38	77.59	14.71	37.73	135.41
NAVY	38.27	17.65	22.28	1.12	79.32
AF	9.21	33.64	17.40	18.16	78.41
TOTAL	52.86	128.88	54.38	57.01	293.13

1996 (MILLIONS)

DOD ORGANIZATION	BUDGET CATEGORY				
	6.1	6.2	6.3	6.4	TOTAL
ARMY	5.23	43.80	4.83	43.19	97.05
NAVY	39.80	19.41	25.80	1.04	86.05
AF	9.71	64.90	17.52	14.09	106.21
TOTAL	54.74	128.11	48.15	58.32	289.31

TABLE II-2

TPST PROGRAM FUNDING 1996
BASED ON FY96 PRESIDENT'S BUDGET

CONGRESSIONAL CATEGORY BY DOD ORGANIZATION

1995 (MILLIONS)

DOD ORGANIZATION	CONGRESSIONAL CATEGORY			
	HF	MP	TS	TOTAL
ARMY	16.77	8.15	110.49	135.41
NAVY	47.99	6.58	24.74	79.32
AF	34.03	4.28	40.10	78.41
TOTAL	98.79	19.01	175.34	293.13

1996 (MILLIONS)

DOD ORGANIZATION	CONGRESSIONAL CATEGORY			
	HF	MP	TS	TOTAL
ARMY	14.99	6.07	76.00	97.05
NAVY	50.55	6.94	28.56	86.05
AF	60.09	1.52	44.60	106.21
TOTAL	125.62	14.53	149.16	289.31

TABLE II-3

TPST PROGRAM FUNDING 1996
BASED ON FY96 PRESIDENT'S BUDGET

CONGRESSIONAL CATEGORY BY PROGRAM ELEMENT
WITHIN DOD ORGANIZATION

1995 ($MILLIONS)

DOD ORGANIZATION
PROGRAM
ELEMENT   CONGRESSIONAL CATEGORY

	HF	MP	TS	TOTAL
ARMY	------	------	------	------
0601102A	2.51	2.24	0.63	5.38
0602308A	0.00	0.00	53.30	53.30
0602716A	14.27	0.00	0.00	14.27
0602785A	0.00	3.12	6.91	10.03
0603003A	0.00	0.00	9.61	9.61
0603007A	0.00	2.79	2.31	5.10
0604715A	0.00	0.00	37.73	37.73
ARMY TOTAL	16.77	8.15	110.49	135.41

TABLE II-3

TPST PROGRAM FUNDING 1996
BASED ON FY96 PRESIDENT'S BUDGET

CONGRESSIONAL CATEGORY BY PROGRAM ELEMENT
WITHIN DOD ORGANIZATION

1995 ($MILLIONS)

DOD ORGANIZATION
PROGRAM
ELEMENT   CONGRESSIONAL CATEGORY

	HF	MP	TS	TOTAL
NAVY	------	------	------	------
0601153N	38.27	0.00	0.00	38.27
0602233N	6.70	1.97	8.98	17.65
0603707N	3.02	3.50	11.98	18.49
0603792N	0.00	0.00	3.79	3.79
0604703N	0.00	1.12	0.00	1.12
NAVY TOTAL	47.99	6.58	24.74	79.32
DOD TOTAL	98.79	19.01	175.34	293.13

TABLE II-3

TPST PROGRAM FUNDING 1996
BASED ON FY96 PRESIDENT'S BUDGET

CONGRESSIONAL CATEGORY BY PROGRAM ELEMENT
WITHIN DOD ORGANIZATION

1995 ($MILLIONS)

DOD ORGANIZATION
PROGRAM
ELEMENT   CONGRESSIONAL CATEGORY

	HF	MP	TS	TOTAL
AF	------	------	------	------
0601102F	9.21	0.00	0.00	9.21
0602202F	16.31	2.70	14.63	33.64
0603227F	0.00	1.58	7.31	8.89
0603231F	8.51	0.00	0.00	8.51
0604227F	0.00	0.00	13.69	13.69
0604243F	0.00	0.00	4.47	4.47
AF TOTAL	34.03	4.28	40.10	78.41

TABLE II-3

TPST PROGRAM FUNDING 1996
BASED ON FY96 PRESIDENT'S BUDGET

CONGRESSIONAL CATEGORY BY PROGRAM ELEMENT
WITHIN DOD ORGANIZATION

1996 ($MILLIONS)

DOD ORGANIZATION
    PROGRAM
    ELEMENT   CONGRESSIONAL CATEGORY

	HF	MP	TS	TOTAL
ARMY	------	------	------	------
0601102A	2.45	1.15	1.63	5.23
0602308A	0.00	0.00	23.77	23.77
0602716A	12.53	0.00	0.00	12.53
0602785A	0.00	2.65	4.85	7.50
0603003A	0.00	0.00	0.00	0.00
0603007A	0.00	2.27	2.56	4.83
0604715A	0.00	0.00	43.19	43.19
ARMY TOTAL	14.99	6.07	76.00	97.05

TABLE II-3

TPST PROGRAM FUNDING 1996
BASED ON FY96 PRESIDENT'S BUDGET

CONGRESSIONAL CATEGORY BY PROGRAM ELEMENT
WITHIN DOD ORGANIZATION

1996 ($MILLIONS)

DOD ORGANIZATION
PROGRAM
ELEMENT   CONGRESSIONAL CATEGORY

	HF	MP	TS	TOTAL
NAVY				
0601153N	39.80	0.00	0.00	39.80
0602233N	7.60	2.03	9.78	19.41
0603707N	3.15	3.87	10.78	17.80
0603792N	0.00	0.00	8.00	8.00
0604703N	0.00	1.04	0.00	1.04
NAVY TOTAL	50.55	6.94	28.56	86.05
DOD TOTAL	125.62	14.53	149.16	289.31

TABLE II-3

TPST PROGRAM FUNDING 1996
BASED ON FY96 PRESIDENT'S BUDGET

CONGRESSIONAL CATEGORY BY PROGRAM ELEMENT
WITHIN DOD ORGANIZATION

1996 ($MILLIONS)

DOD ORGANIZATION
PROGRAM
ELEMENT   CONGRESSIONAL CATEGORY

		HF	MP	TS	TOTAL
AF		------	------	------	------
	0601102F	9.71	0.00	0.00	9.71
	0602202F	41.79	0.00	23.11	64.90
	0603227F	0.00	1.52	7.41	8.93
	0603231F	8.59	0.00	0.00	8.59
	0604227F	0.00	0.00	8.79	8.79
	0604243F	0.00	0.00	5.30	5.30
AF	TOTAL	60.09	1.52	44.60	106.21

TABLE II-4

TPST PROGRAM FUNDING 1996
BASED ON FY96 PRESIDENT'S BUDGET

CONGRESSIONAL CATEGORY BY BUDGET CATEGORY

1995 (MILLIONS)

BUDGET CATEGORY	CONGRESSIONAL CATEGORY			
	HF	MP	TS	TOTAL
6.1	49.99	2.24	0.63	52.86
6.2	37.28	7.79	83.82	128.88
6.3	11.53	7.86	34.99	54.38
6.4	0.00	1.12	55.89	57.01
TOTAL	98.79	19.01	175.34	293.13

1996 (MILLIONS)

BUDGET CATEGORY	CONGRESSIONAL CATEGORY			
	HF	MP	TS	TOTAL
6.1	51.96	1.15	1.63	54.74
6.2	61.92	4.69	61.50	128.11
6.3	11.74	7.65	28.75	48.15
6.4	0.00	1.04	57.28	58.32
TOTAL	125.62	14.53	149.16	289.31

TABLE II-5

TPST PROGRAM FUNDING 1996
BASED ON FY96 PRESIDENT'S BUDGET

CONGRESSIONAL CATEGORY BY BUDGET CATEGORY
WITHIN DOD ORGANIZATION

1995 ($MILLIONS)

DOD ORGANIZATION
BUDGET
CATEGORY   CONGRESSIONAL CATEGORY

	HF	MP	TS	TOTAL
ARMY				
6.1	2.51	2.24	0.63	5.38
6.2	14.27	3.12	60.21	77.59
6.3	0.00	2.79	11.92	14.71
6.4	0.00	0.00	37.73	37.73
ARMY TOTAL	16.77	8.15	110.49	135.41
NAVY				
6.1	38.27	0.00	0.00	38.27
6.2	6.70	1.97	8.98	17.65
6.3	3.02	3.50	15.77	22.28
6.4	0.00	1.12	0.00	1.12
NAVY TOTAL	47.99	6.58	24.74	79.32
AF				
6.1	9.21	0.00	0.00	9.21
6.2	16.31	2.70	14.63	33.64
6.3	8.51	1.58	7.31	17.40
6.4	0.00	0.00	18.16	18.16
AF TOTAL	34.03	4.28	40.10	78.41
DOD TOTAL	98.79	19.01	175.34	293.13

TABLE II-5

TPST PROGRAM FUNDING 1996
BASED ON FY96 PRESIDENT'S BUDGET

CONGRESSIONAL CATEGORY BY BUDGET CATEGORY
WITHIN DOD ORGANIZATION

1996 ($MILLIONS)

DOD ORGANIZATION
  BUDGET
  CATEGORY   CONGRESSIONAL CATEGORY

	HF	MP	TS	TOTAL
ARMY				
6.1	2.45	1.15	1.63	5.23
6.2	12.53	2.65	28.62	43.80
6.3	0.00	2.27	2.56	4.83
6.4	0.00	0.00	43.19	43.19
ARMY TOTAL	14.99	6.07	76.00	97.05
NAVY				
6.1	39.80	0.00	0.00	39.80
6.2	7.60	2.03	9.78	19.41
6.3	3.15	3.87	18.78	25.80
6.4	0.00	1.04	0.00	1.04
NAVY TOTAL	50.55	6.94	28.56	86.05
AF				
6.1	9.71	0.00	0.00	9.71
6.2	41.79	0.00	23.11	64.90
6.3	8.59	1.52	7.41	17.52
6.4	0.00	0.00	14.09	14.09
AF TOTAL	60.09	1.52	44.60	106.21
DOD TOTAL	125.62	14.53	149.16	289.31

ARMY Program Element and Project Synopses

PROGRAM ELEMENT OVERVIEW

PE: 0601102A DEFENSE RESEARCH SCIENCES

FUNDING: FY95 $ 5.4M (FY96 PRESIDENT'S BUDGET)
                                  FY96 $ 5.2M (FY96 PRESIDENT'S BUDGET)

PE SYNOPSIS:

This Program Element is focused on sustaining the Army's technological
superiority for effectiveness in land warfighting capability and the Army
Vision for Force XXI. The program focuses in-house laboratory research on
Army unique expertise and capabilities, capitalizing on the scientific
talent and specialized facilities to expeditiously transition the resulting
knowledge and technology into the appropriate developmental activities. The
extramural program leverages the research efforts of other government
agencies, academia, and industry for those areas where the Army does not
have the technical lead. This translates to a coherent, well-integrated
program which is executed by the following six primary contributors: 1) the
Army Research Laboratory (ARL); 2) the seven Army Materiel Command
Research, Development and Engineering Centers (RDECs); 3) the four Army
Corps of Engineer laboratories; 4) the six Army Medical Research and
Materiel Command laboratories; 5) the Army Research Institute; and 6) the
Army Research Office (ARO). The Army's research program promotes quality
through activities such as in-depth reviews of the entire basic research
program at all levels and the development of strategic research objectives.
The Army broadened its research base by expanding basic research investment
in Historically Black Colleges and Universities and Minority Institutions
(HBCU/MI) to 5% of its Individual Investigator program. This core research
program is complemented by the inter-disciplinary research performed under
the University Research Initiative (URI) program. The basic research
program is coordinated with the other Services via the Joint Directors of
Laboratories panels, Project Reliance, and other interservice working
groups.

The work in this Program Element is consistent with rigorous peer review,
the Army Science and Technology Master Plan (ASTMP), Science and Technology
Objectives (STO) milestones for the Army's key emerging technologies, and
the Army Modernization Plan. The projects in this PE include basic research
efforts directed toward providing fundamental knowledge for the solution of
military problems; and therefore, are correctly placed in Budget Activity
1. The resultant science base provides the source for follow-on exploratory
development (6.2) and, eventually, advanced technology development (6.3)
programs.

RELATED ACTIVITIES:

Work in this Program Element is related to and fully coordinated with
efforts in PE 0601104A (University/Industry Research Centers), PE 0602120A
(Electronic Survivability and Fuzing Technology), PE 0602623A (Joint
Service Small Arms Program), PE 0602624A (Weapons and Munitions
Technology), PE 0602720A (Environmental Quality Technology) (DA Proj 835

only), PE 0602784A (Military Engineering Technology), PE 0602786A (Logistics Technology), PE 0602787A (Medical Technology), PE 0601102A (Defense Medical Sciences), PE 0603105A (Medical Human Immunodeficiency Virus (HIV) Research), PE 0603002A (Medical Advanced Technology), PE 0603807A (Medical Systems-Advanced Development), PE 0604807A (Medical Material/Medical Defense Equipment-Engineering Development), PE 0605801A (Program-wide Activities, Project MM02), PE 0605898A (Management Head-quarters R&D, Project MM03), and PE 0601103D, University Research Initiatives; the Navy, Air Force, and other Department of Defense agencies; National Aeronautics and Space Administration; National Science Foundation; Department of Interior; Department of Energy; National Bureau of Standards; other Government agencies; and government agencies of Allied nations sponsor related research in areas of this program.

PAYOFF/UTILIZATION:

The payoff of the MPT portion of this Program Element is a behavioral science base on which to build new technologies to improve the effectiveness of soldiers and systems.

This basic research's contribution to the Army lies substantially in seeking new exploratory and advanced development to enhance soldier performance and behavior, and in enlisting civilian scientific skills and facilities (university and industry) to cooperatively address Army needs to explore and transition new technologies into applications to solve Army personnel problems.

PROJECT OVERVIEW

	95	96

PROJECT: B74A   HUMAN ENGINEERING $2.5M $2.5M

PE: 0601102A DEFENSE RESEARCH SCIENCES

CONGRESSIONAL CATEGORY: HUMAN FACTORS

PROJECT SYNOPSIS:

This Project supports research in soldier performance, including the areas
of visual, auditory, cognitive, and stress-related performance. The
objective is to identify, describe, and manage underlying human-system
interface factors critical to the design of Army weapon systems. The work
inthis program is consistent with the Army Science and Technology Master
Plan (ASTMP), the Science and Technology Objectives (STO), and the Army
Modernization Plan. All work under PE 0601102A is part of the
"Human-SystemsInterfaces" Tri-Service Reliance Panel.

FY95, plans: a) expand graphical information display research by developing
and testing decision aids for ground-combat personnel; b) conduct studyto
isolate human errors due to deficiencies of visual cues caused by limited
depth perception with night vision devices; c) establish field-of-view and
resolution requirements for remote driving; d) propose international noise
standard; demonstrate "meter" for assessing noise hazards; e) develop
stress amylase procedures for field use; f) funds will be reprogrammed for
SBIR/STTR programs in accordance with the Small Business Innovation
Research Program Reauthorization Act of 1992.

FY96 plans: a) design, construct and characterize optical processors for
image and signal processing, incorporating refractive, diffractive and/or
integrated optical elements; b) continue research on components for optical
control of microwaves by combining integrated optic beam splitter with
phase modulators and amplifier structures; c) construct and characterize
photonic implementations of cyclic correlation algorithms; d) demonstrate
hybrid integrated smart pixel employing vertical cavity surface-emitting
lasers for 2D optical processing, image processing, and neural nets for
aided target recognition; e) investigate Ferroelectric/ Field Effect
Transistor (FE/FET) approaches to developing simple memory cell designs for
very-high-density non-volatile memories; f) apply the Giant
Magnetoresistive (GMR) effect to non-volatile memory design.

PAYOFF/UTILIZATION:

FY94 specific accomplishments: a) conducted research on
cognitive-behavioral performance related to graphical information display;
b) completed high-fidelity studies on perceived target position in the
field using 2D display, and effects of training on perception of 3D
information on 2D display; c) completed studies comparing combat
identification (ID), ranging performance with and without programmed combat
ID devices; d) initiated study of effects of field-of-view and resolution
on remote vs. onboard driving performance; e) reactivated NATO Research

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Study Group, considered ear model for international use; and f) demonstrated validation of salivary amylase procedures as a stress measurement tool for field use.

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PROJECT OVERVIEW

	95	96
PROJECT: B74F-ET PERSONNEL PERFORMANCE AND TRAINING	$0.6M	$1.6M

PE: 0601102A   DEFENSE RESEARCH SCIENCES

CONGRESSIONAL CATEGORY: TRAINING SYSTEMS

PROJECT SYNOPSIS:

This Project conducts behavioral science research in the following areas of human performance: a) variables and processes determining effective group functioning, leader-group interaction, and decision-making; and b) principles of technology-based instructional methods that promote the learning of cognitive, perceptual-motor, and unit-performance tasks by individuals and groups.

This Project represents the Education and Training aspect of the 6.1 Program Element.

FY95 plans include initiating research to facilitate "on demand" and "just in time" training for teams and individuals.

FY96 plans: a) continue research on new issues in training and determine behavioral mechanisms that underlie the relationship between performance in simulators and the real world; b) fine-tune methodology for extended multivariate research in behavioral science, and explore behavioral techniques to facilitate fast learning.

PAYOFF/UTILIZATION:

FY94 specific accomplishments included support of Army readiness efforts, with continuation of research on long-term skill retention and transfer.

PROJECT OVERVIEW

	95	96

PROJECT: B74F-MP   PERSONNEL PERFORMANCE $2.2M $1.1M
                          AND TRAINING

PE: 0601102A DEFENSE RESEARCH SCIENCES

CONGRESSIONAL CATEGORY: MANPOWER and PERSONNEL

PROJECT SYNOPSIS:

The objective of this Project is to conduct behavioral science research in
the following areas of human performance: a) variables and processes
determining effective group functioning, leader-group interaction, and
decision-making; b) factors that determine effective, low-error human
performance in decision-making and complex equipment operation in stressful
military environments; and c) principles for technology-based instructional
methods that promote the learning of cognitive, perceptual-motor, and
unit-performance tasks by individuals and groups.

This Project represents the Manpower and Personnel aspect of the 6.1
Program Element.

FY95 plans: a) continue chronopsychological research contributing to owning
the night, and explorations of new methodologies for behavioral research
and performance analysis; b) extend research on sociological conceptions of
functional Army elements, peace operations, and attitudes underlying career
choice and enlistment propensity; c) continue analysis of leader behavior
as influenced by motivational variables, and explore measures of
leadership; d) funds will be reprogrammed for SBIR/STTR programs in
accordance with the Small Business Innovation Research Program
Reauthorization Act of 1992.

FY96 plans: a) initiate research on soldier skills for flexible operations,
and continue Army social structure analyses; b) complete research on the
sharpening of leader skills and the impact of leadership on organizational
dynamics and productivity.

PAYOFF/UTILIZATION:

FY94 specific accomplishments: a) completed assessment of, and initiated
new research on, peace operations problems and comparative personnel
policies; b) published leader-experience research, and continued efforts to
clarify role of motivation in sharpening leader skills; c) explored
advanced techniques to facilitate battlefield alertness at night and
developed understanding of role of personality in performance.

PROGRAM ELEMENT OVERVIEW

PE: 0602308A MODELING AND SIMULATION TECHNOLOGY

FUNDING: FY95 $ 53.3M (FY96 PRESIDENT'S BUDGET)
                                      FY96 $ 23.8M (FY96 PRESIDENT'S BUDGET)

PE SYNOPSIS:

Work in this Program Element (PE) advances the development and use of
modeling and simulation, including Distributed Interactive Simulation (DIS)
as related to Army-specific experiments/demonstrations and industry
participation at the U.S. Army Training and Doctrine Command (TRADOC)
Battle Labs and Army's Louisiana Maneuvers (LAM). It develops standards,
architecture and interfaces that are essential to realizing the DoD/Army
vision of creating a verified, validated and accredited synthetic
"electronic battlefield" environment.

The electronic battlefield is used to investigate and demonstrate new
warfighting concepts and approaches including development of tactics,
doctrine, training techniques, soldier support, systems and system
upgrades. It directs and stimulates advances in those technologies required
for real-time interactive linking within and among constructive, virtual
and live simulations.

Work also supports planning and execution of the Advanced Concepts and
Technology (ACT) II program, which evaluates new concepts. ACT II focuses
on providing a timely, low-overhead mechanism for industry and academia to
participate in the Army's Louisiana Maneuvers (LAM) and TRADOC Battle Labs
warfighting demonstrations and experiments.

The work in this Program Element is consistent with the Army Science and
Technology Master Plan and the Army Modernization plan. Efforts in this
Program Element include non-system specific development efforts pointed
toward specific military needs, and therefore, are appropriate to Budget
Activity 2.

In FY95, simulation technology development was consolidated into Project
AC90 from PE 0603003A and PE 0602727A.

Simulation Training and Instrumentation Command (STRICOM), Orlando, FL, is
responsible for Project AC90 and Army Research Office, Raleigh, NC, is
responsible for Project AC99.

RELATED ACTIVITIES:

Future efforts will be performed by a broad range of contractors selected
in response to the Broad Agency Announcement (BAA) process. This program is
fully coordinated with the Army exploratory development programs, Advanced
Research Projects Agency (ARPA), Defense Modeling and Simulation Office,
TRADOC and DoD Project Reliance agreements on conventional air/surface
weaponry with oversight provided by the Joint Directors of Laboratories.

Work in this Program Element is related to and fully coordinated with efforts in PE 0604715A (Non-System Training Devices- Engineering Development).

There is no unnecessary duplication of effort within the Army or DoD.

PAYOFF/UTILIZATION:

The payoff of this PE is advancement of modeling and simulation technologies necessary for the DoD/Army to create and use a verified, validated, and accredited synthetic "electronic battlefield" environment, so that new warfighting concepts and approaches can be investigated and demonstrated.

PROJECT OVERVIEW

	95	96

PROJECT: AC90   DISTRIBUTED INTERACTIVE $13.4M $11.3M
                       SIMULATION (DIS)
                       TECHNOLOGY

PE: 0602308A MODELING AND SIMULATION TECHNOLOGY

CONGRESSIONAL CATEGORY: TRAINING SYSTEMS

PROJECT SYNOPSIS:

This Program provides and demonstrates enabling technologies advancing
Distributed Interactive Simulation (DIS) networking capabilities and
synthetic representation of the battlefield needed to support virtual
prototyping and training in the era of reduced funding.

Efforts in this project support the Battlefield Distributed Simulation-
Developmental program (BDS-D) and will provide virtual representation of a
lethal, combined-arms environment with the warfighter-in-the-loop that
closed-form analysis cannot provide. The environment permits new system
concepts, tactics and doctrine and test requirements to be evaluated with a
warfighter-in-the-loop in a combined-arms battlefield throughout the
acquisition life cycle at a reduced cost and time than the traditional
approach. The research being conducted includes Semi-Automated Forces
(SAFOR), dynamic terrain and database development for networking. Arrival
of this sophisticated technology, equipment, and the complex relations to
each other, makes this effort critical to overall success of Army
acquisition and training requirements.

This Project will be established in FY95. Related work previously was
performed in PE 0602727A, Project A230, Non-Systems Training Devices, and
PE 0603003A, Project DB39, Advanced Distributed Simulation.

FY95 plans: a) define requirements and conduct experiments to demonstrate
linkage of constructive (analytical and training war game models) and
virtual simulations (simulators and computer generated forces) in DIS
environments; b) define the virtual reality interface and architecture
requirements to network the dismounted infantry into the DIS environment;
c) expand the Battlefield Operating System (BOS) functionality and
capability supporting division level DIS experiments and mission rehearsals
to include command, control, and communications and counter-measure DIS
environments; d) enhance standard for terrain databases to assure
correlation and interoperability among simulators, semi-automatic forces,
and constructive simulations; e) develop soldier station prototypes like
JANUS and BDS-D simulators employing DIS protocols; f) demonstrate dynamic
terrain capability for DIS and investigate architectural changes to
integrate into the DIS; g) continue development of standards for
interfacing of Command, Control, Communications and Intelligence and
Electronic Warfare (C3IEW) and initial (real) tactical communication
systems and simulations to distributed combat/wargame simulations for
digitizing the battlefield; h) establish and develop internet capabilities

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of the Federal Laboratory initiative of the Army Research Laboratory (ARL); i) upgrade hardware, software, and interfaces for the Land Warrior Test Bed to facilitate infantry systems participation in virtual prototyping, advanced concepts, advanced technology demonstrations and DIS exercises; j) funds will be reprogrammed for SBIR/STTR programs in accordance with the Small Business Innovation Research Program Reauthorization Act of 1992.

FY96 plans: a) continue development of standards for interfacing of C3IEW systems and C3IEW simulations to distributed combat/wargame simulations for digitizing the battlefield; b) conduct experiments to provide DIS support of fielding of digitized division level force; c) define the method and computational approach for full level force representation with the capability to be reconfigurable to varying battlefield behaviors; d) continue expansion of the architecture to support division level DIS experiments and mission rehearsals.

PAYOFF/UTILIZATION:

Project established in FY95. Related work previously performed in PE 0602727A, Project A230, Non-Systems TrainingDevices and PE 0603003A, Project DB39, Advanced Distributed Simulation.

PROJECT OVERVIEW

	95	96

PROJECT: AC99

MODELING AND SIMULATION
TECHNOLOGY (ADVANCED
CONCEPTS AND TECHNOLOGY)

$39.9M $12.4M

PE: 0602308A MODELING AND SIMULATION TECHNOLOGY

CONGRESSIONAL CATEGORY: TRAINING SYSTEMS

PROJECT SYNOPSIS:

This Project supports the Advanced Concepts and Technology (ACT) II
Program.ACT II provides a timely, low-overhead mechanism with a yearly
Broad Agency Announcement (BAA) for industry and academia to demonstrate
mature technologies, concepts, software and/or systems for assessment by
the TRADOC Battle Labs and Louisiana Maneuvers Task force. It supports new
concepts evaluations through modeling and simulation in real-time, soldier-
in-the-loop, virtual and constructive, electronic battlefield
demonstrations and field tests. Specific areas of interest include: a)
battlespace management and battlefield synchronization; b) depth and
simultaneous attack capabilities; c) early-entry operations, lethality,
survivability and mobility; d) command, control, communications and
computers (to include interoperability); e) force sustainment; and f)
doctrine and leader development.

FY95 plans: a) conduct demonstrations and experiments in support of the
Battle Labs and Louisiana Maneuvers (LAM); b) release BAA to solicit Battle
Lab and LAM-related concepts and technologies from the nation's industrial
and academic communities; c) initiate two step proposal, two page
pre-proposal followed by invitation for full proposals; d) select, within
resource constraints, high payoff and innovative efforts for demonstration
of new warfighting capabilities; d) analyze and evaluate the results of
FY94 efforts; identify candidates for streamlined acquisitions; e)
establish an order of merit list to provide continued funding to the
most promising FY94 efforts; f) approve BAA topics for new ACT II projects
to satisfy future Army and DoD needs not being addressed by existing
programs; g) funds will be reprogrammed for SBIR/STTR programs in
accordance with the Small Business Innovation Research Program
Reauthorization Act of 1992.

FY96 plans: a) conduct demonstrations and experiments in support of the
Battle Labs and LAM; b) release BAA to solicit Battle Lab and LAM-related
concepts and technologies from the nation's industrial and academic
communities; c) select, within resource constraints, high payoff and
innovative efforts for demonstration of new warfighting capabilities; d)
analyze and evaluate·the results of FY95 efforts; identify candidates for
streamlined acquisitions; e) approve BAA topics for new ACT II projects to
satisfy future Army and DoD needs not being addressed by existing programs.

PAYOFF/UTILIZATION:

FY94 specific accomplishments: a) ACT II program initiated in FY94; b) awarded 28 contracts as a results of more than 300 proposals submitted in response to a BAA.

PROGRAM ELEMENT OVERVIEW

PE: 0602716A HUMAN FACTORS ENGINEERING TECHNOLOGY

FUNDING: FY95 $ 14.3M (FY96 PRESIDENT'S BUDGET)
                                FY96 $ 12.5M (FY96 PRESIDENT'S BUDGET)

PE SYNOPSIS:

This Program Element (PE) focuses on maximizing the effectiveness of the
soldier in concert with his materiel, in order to survive and prevail on the
battlefield.

The 21st Century Land Warrior (21CLW) program is directly supported by this
soldier-system performance and supportability enhancement program.

Specialized laboratory studies and field evaluations are conducted to
collect performance data on the capabilities and limitations of soldiers,
with particular attention on soldier and equipment interaction. The
resulting data are the basis for weapon systems and equipment design
standards, guidelines, handbooks, and soldier training and manpower
requirements to improve operation and maintenance. Application of
advancements yield reduced workload, fewer errors, enhanced soldier
protection, user acceptance, and allows the soldier to extract the maximum
performance from his equipment.

In FY94, the Manpower, Personnel, Training, Health Hazards and Safety
(MANPRINT) functions from PE 602785A.BB2 and PE 603007A.792 were
restructured into this Program Element. In addition, the Human Factors
Engineering in System Design portion of PE 603007A.796 was transferred to
this PE in FY94.

In-house work is primarily performed by the Army Research Laboratory, Human
Research and Engineering Directorate (HRED), Aberdeen Proving Ground, MD;
and at ARL-HRED sites at supported installations: Fort Bliss, TX; Fort
Hood, TX; Picatinny Arsenal, NJ; Fort Knox, NJ; St. Louis, MO; Fort Rucker,
AL; Fort Belvoir, VA; Fort Monmouth, NJ; Edgewood, MD; Redstone Arsenal,
AL; Alexandria, VA; Fort Gordon, GA; Orlando, FL; Warren, MI; Fort Sill,
OK; Fort Benning, GA; Fort Bragg, NC; Warrenton, VA; and Fort Huachuca, AZ.

RELATED ACTIVITIES:

The work in this Program is consistent with the Army Science and Technology
Master Plan (ASTMP) and the Army Modernization Plan.

All work under this PE is part of the "Human-Systems Interfaces"
Tri-Service Reliance Panel.

PAYOFF/UTILIZATION:

The payoffs of this Program Element include completion of task analyses of a
four-man main battle tank and identification of technology options for

redistributing tasks to a two-man crew.

PROJECT OVERVIEW

	95	96
PROJECT: AH70 HUMAN FACTORS ENGINEERING SYSTEMS DEVELOPMENT	$14.3M	$12.5M

PE: 0602716A   HUMAN FACTORS ENGINEERING TECHNOLOGY

CONGRESSIONAL CATEGORY: HUMAN FACTORS

PROJECT SYNOPSIS:

This program focuses on maximizing the effectiveness of the soldier in concert with his material, in order to survive and prevail on the battlefield.

FY95 plans: a) complete Knowledge-Based Logistics Planning Shell (KBLPS) Style Guide, including domain definition, conceptual design, and design requirements for all major KBLPS components, with justifications derived from user studies; complete an operational prototype of map-based user interface management system; b) complete integration of mobile manipulator platform control; complete VRRTFL sensor and automation enhancements for pallet acquisition; demonstrate robotic manipulators with force and tactile sensors, and investigate time-delay and reduced bandwidth communication; develop a robotic workcell to research automated materials handling, including hazardous environments; c) expand use of auditory detection model to include predictions for impulse noise, and demonstrate operator guidance with 3-D auditory display, including development of speech intelligibility measures for possible insertion to future individual soldier equipment ensembles; d) complete experiments on aids for collaborative decision-making with a force "on the move"; e) complete mobility platform, and integrate with upper body sensor suit on helmet-mounted display; continue integration with enhanced JACK model; improve distributed interactive simulation system compatibility; develop integrated task network models, using the JACK model; develop natural language instruction, and complete enhancement of the JACK model; f) prepare HARDMAN III incremental review report; develop integrated MANPRINT tools (IMPRINT), Version 1.0, with initial analysis capability; g) exercise battlefield-hazardous environmental simulator with fielded and prototype systems to develop calibration procedures, data collection procedure, and a Standard Operating Procedure (SOP) for human use; h) enhance MANPRINT field T&E methods with soldier-in-the-loop operational test exercise data to upgrade Test and Evaluation Experiments Command capabilities to assess new-technology systems; i) derive field, laboratory, and simulation exercise data to form parameters for MANPRINT evaluation and design support to TRADOC, AMC, BattleLabs, RDECs, and laboratories; j) complete evaluations of proposed symbology for MIL-STD-2525 (Common Warfighting Symbology), and analyze results; present results to the Defense Information Systems Agency (DISA); k) complete transition of VIP/GPS technology to ARDEC; l) funds will be reprogrammed for SBIR/STTR programs in accordance with the Small Business Innovation Research Program Reauthorization Act of 1992.

FY96 plans: a) develop operational prototype of information exploration tool, including operational prototype of the management of the multitude of assumptions made by the user (ASSUMPTION MANAGER), and interactive logistics planning prototype with automated graphics generation; b) collect performance data on sensor-human feedback interface devices, exoskeleton control devices for human positioning and monitoring and multi degree of freedom force sensors. Complete Advanced Armored Vehicle Technology (AAVT) study on armor vehicle containerization. Continue the palletized loading system container lift kit study; c) improve the Auditory Detection Model (ADM) through localization and impulse noise detection; d) conduct Performance Research to evaluate advanced controls and displays for a force "on the move" in adverse environments; e) enhance virtual reality system with state-of-the-art technology, as necessary, including enhancement of JACK model to act as intelligent semi-automated forces in distributed interactive simulations and implementation of the improved real-time body collision avoidance algorithms for the human figure performance model; f) develop integrated MANPRINT tools (IMPRINT), Version 1.0, accreditation review report. Develop integrated MANPRINT tools (IMPRINT), Version 2.0 with full-scale analysis and process-linked capability. Develop trade-off tool in integrated MANPRINT tools (IMPRINT), to assess effects of available manpower and personnel characteristics on system redesign options; g) integrate hostile environment simulator with individual soldier's portal (I-PORT); h) complete the Light Helicopter/ RAH-66 Comanche force development test and experimentation II, and validate MANPRINT tools for evaluation of new systems; and i) provide MANPRINT and Human Factors Engineering (HFE) support.

PAYOFF/UTILIZATION:

FY94 specific accomplishments: a) demonstrated a knowledge-based decision support system that enables interactive planning and scheduling for all classes of supply, typical of the size and complexity of Desert Storm; b) initiated Variable Reach Rough Terrain Fork Lift (VRRFTL) sensor and automation enhancements, and report on field trials. Initiated the investigations of robotic systems with haptic, touch, and force feedback. Completed HARDMAN III modelling for palletizing loading system. Integrated the National Institute for Science and Technology Real-Time Control software onto the field material-handling system for the user interface; c) enhanced the Auditory Detection Model (ADM) by developing and incorporating a method for measuring ground impedance and its effects; demonstrated 3-D auditory sound localization; d) conducted software experiments on brigade staff Intelligence Decision Support System (IDDS) requirements, including development of a prototype for demonstration; e) demonstrated enhanced virtual reality capabilities for individual soldier simulation, including mobility platform; initiated integration of JACK model with simulated environment. Incorporated body strength data into the JACK model. Exploited novel input devices to translate user movement into virtual figure behaviors; f) developed a database to support analyses of the soldier as a system; g) developed simulation software to drive soldier resource extremes at force-level; developed simulation software task performance for novel technology; ran initial tests on next generation HARDMAN III. Integrated MANPRINT tools (IMPRINT). Initiated verification and validation of HARDMAN III MANPRINT Tools. Prepared HARDMAN III initial accreditation review report; h) conducted testing and evaluation of battlefield-hazardous environment simulation facility, and evaluated heads-up display for rifle sight; i) enhanced MANPRINT field Test and Evaluation (T&E) methods with soldier-in-the-loop operational test exercises to reduce costs and timeliness burden to Test Evaluation Experiments Command; j) obtained data to form parameters of MANPRINT models while providing MANPRINT evaluation

and design support to Training and Doctrine Command (TRADOC), Army Materiel Command (AMC), BattleLabs, Research, Development and Engineering Centers (RDECs), and laboratories; k) incorporated modifications, and submitted for publication the draft MIL-STD-1477C, Symbols for Army Systems. Initiated human factors research on the symbology proposed in draft MIL-STD-2525, Common Warfighting Symbology, and coordinated with the Defense Information Systems Agency (DISA); l) completed demo of VIP/GPS for artillery application.

PROGRAM ELEMENT OVERVIEW

PE: 0602785A MANPOWER, PERSONNEL, AND TRAINING TECHNOLOGY

FUNDING: FY95 $ 10.0M (FY96 PRESIDENT'S BUDGET)
                              FY96 $ 7.5M (FY96 PRESIDENT'S BUDGET)

PE SYNOPSIS:

The objective of this Program Element is to provide a scientifically-sound
basis for maximizing soldier and unit performance through empirical
research, the results of which lead to: a) cost-effective training
strategies for synthetic environments; b) optimum simulator designs to
achieve maximum learning at minimum cost; c) enhanced battle command
performance; and d) improved selection and classification of soldiers to
maintain the Army's warfighting edge.

The majority of the research conducted in this Program Element transitions
to manpower, personnel, and training advanced development work in Program
Element 0603007A.

Work in this Program Element is consistent with the Army Science and
Technology Master Plan, the Army Modernization Plan, and Project Reliance.
These projects include non-system specific development efforts pointed
toward specific military needs, and are, therefore, appropriate to Budget
Activity 2.

This Program Element is managed by the U.S. Army Research Institute for the
Behavorial and Social Sciences (ARI), Alexandra, VA.

RELATED ACTIVITIES:

Work in this PE is consistent with the Army Science and Technology Master
Plan, the Army Modernization Plan, and Project Reliance.

The efforts funded in this project are non-system-specific, and represent
exploratory development in the area of personnel systems and performance
technology.

PAYOFF/UTILIZATION:

The payoff of this Program Element includes providing a scientifically-
sound technology base for maximizing soldier and unit performance.

PROJECT OVERVIEW

		95	96
PROJECT: A790	PERSONNEL SYSTEMS AND PERFORMANCE TECHNOLOGY	$3.1M	$2.7M

PE: 0602785A MANPOWER, PERSONNEL AND TRAINING TECHNOLOGY

CONGRESSIONAL CATEGORY: MANPOWER and PERSONNEL

PROJECT SYNOPSIS:

The objectives of this Project are to provide the scientific basis for improved methods for leader assessment and development, enhanced selection and classification procedures to ensure the right person is placed in the right job, improved organizational design to enhance warfighting decision-making, and methods for determining effective utilization of soldiers with minimal entry qualifications. This project will also develop methods for effective organizational design and leadership. Research under this project supports the Manpower and Personnel Defense Technology Area.

Funding figures for FY93, FY94, and FY95 are based on the new Project structure.

FY95 plans: a) evaluate a new paradigm of distributed battle command planning and decision-making, including the development of staff group design modeling tools; b) develop new measures of performance-related aptitude, leadership, and stress tolerance; c) model the leader development process including the relationships among problem-solving capabilities, leadership style, and rated effectiveness; d) develop new selection techniques for enlistees with low mental aptitude scores; e) conduct analyses on the long-term effects of peacekeeping missions on soldier career development; f) conduct a broad-range investigation of selection, training, integration, and development of reserve volunteers for peacekeeping missions in the Sinai; g) funds will be reprogrammed for SBIR/STTR programs in accordance with the Small Business Innovation Research Reauthorization Act of 1992.

In FY96: a) validate new measures of performance- related aptitude, leadership, and stress tolerance; b) model the development of commander knowledge and skills; c) develop methods for measuring the leadership knowledge acquired through operational experience; d) conduct cross-sectional analyses of lessons learned in peace operations using life course methodologies; e) develop prototype whole-Army system for classifying jobs; f) identify economic, family support and career commitment factors that influence a reservist's decision to volunteer for operations other than war.

PAYOFF/UTILIZATION:

FY94 specific accomplishments: a) developed techniques to identify the decision-making requirements of command and control tasks, and identified critical competencies for battalion-level battle commanders; b) identified

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predictors of cadet leader development; c) developed a model of key leadership and organizational strategies which influence attitudes and commitment of survivors of downsizing; d) developed strategies to counter the effects of coaching and faking on temperament measures; e) developed methods for identifying optimal job assignments for lower-aptitude personnel; f) conducted experimental investigation of issues related to ensuring survey data quality.

PROJECT OVERVIEW

	95	96
PROJECT: A791 EDUCATION AND TRAINING TECHNOLOGY	$6.9M	$4.8M

PE: 0602785A MANPOWER, PERSONNEL AND TRAINING TECHNOLOGY

CONGRESSIONAL CATEGORY: TRAINING SYSTEMS

PROJECT SYNOPSIS:

The objectives of this Project are to provide the behavioral technology required for the development of effective individual and collective (unit) training strategies using simulation-based synthetic environments. Research conducted in this Project builds on recent advances in the cognitive sciences, and will provide an empirical basis for improved collective (unit)training strategies and techniques for brigade and below, training methods for night operations, individual training strategies exploiting "virtual reality" technology for training and rehearsal of warfighting missions and Operations Other than War (OOTW), "intelligent tutor" technology for foreign language training, and determination of task-based fidelity requirements for cost-effective simulator training on selected aviation tasks. Research under this project directly supports the Training Systems Defense Technology Area.

Funding figures for FY93, FY94 and FY95 are based on the new Project structure.

FY95 plans: a) develop and evaluate field-expedient methods for maximizing soldier visual acuity at night; b) demonstrate a portable, computer-based foreign language tutor prototype; c) develop model for predicting amount of training needed to retrain mobilized soldiers; d) develop prototype trainingmethods to facilitate team training and the acquisition of collective skills in a Distributed Interactive Simulation (DIS) environment; e) empirically determine the content requirements of flight simulator scenes for critical aviation tasks; f) develop and demonstrate multi-Service training methods in a DIS environment; g) determine performance and training requirements for future digitized forces.

FY96 plans: a) design and test methodology for developing brigade and multi-service training and assessment programs; b) determine display resolution requirements for flight simulator-based task training; c) develop training technologies for digitized armored forces (Force XXI); d) develop training techniques for using image intensification and infrared sensing devices to enhance performance in night operations.

This is continuing work which is reviewed periodically, ensuring quality, relevance, and priority.

PAYOFF/UTILIZATION:

FY94 specific accomplishments: a) assessed the capability of performing

land navigation and target detection in a virtual reality enviroment; b) tested prototype unit skill acquisition and retention model using armor platoon tasks in a simulated training environment; c) determined team coordination training requirements for medical emergency teams; d) determined visual scene requirements for helicopter gunnery training; e) determine database texture requirements for nap-of-the-earth helicopter flight training in simulators.

PROGRAM ELEMENT OVERVIEW

PE: 0603003A AVIATION ADVANCED TECHNOLOGY

FUNDING: FY95 $ 9.6M (FY96 PRESIDENT'S BUDGET)
                                       FY96 $ 0.0M (FY96 PRESIDENT'S BUDGET)

PE SYNOPSIS:

The object of this Program Element (PE) is to develop aeronautical
technology for new and/or upgrades to DoD/Army Vertical Take-off and
Landing (VTOL) airmobile systems. Helicopter rotors provide low disc
loading as compared to the tilt rotor's intermediate disc loading and
vertical lift jet engine's high disc loading. Low disc loading VTOL
aircraft offer a practical solution to many of the DoD/Army's operational
needs. Such aircraft, with their ability to operate below tree-top level
for Nap-of-the-Earth (NOE) missions, present significantly different
analysis and design challenges from traditional fixed-wing aircraft, which
fly at higher altitudes. The Army Aviation Science and Technology program's
functional organization, with assistance from National Aeronautics and
Space Administration (NASA) at three co-located activities, is the focal
point for U.S. efforts in rotorcraft technology. Technical Areas include
aeromechanics, aerodynamics, structures, propulsion, reliability and
maintainability, safety and survivability, mission support equipment,
aircraft system synthesis, aircraft subsystems, advanced helicopter
analysis, flight simulation, aircrew-aircraft integration, aircraft
weapons, aircraft avionics for command and control, air-to-air/air-to-ground
communications, controls and displays, digital avionics and architectures,
NOE navigation, mission planning, air traffic management and investigation
and selective application of Integrated Product and Process Development
(IPPD) techniques. These technologies are continuously being researched for
applications to improve and correct deficiencies in current DoD/Army VTOL
aircraft systems, and to improve the capabilities of future rotorcraft. The
work in this PE is consistent with the Army Science and Technology Master
Plan (ASTMP) and Army Modernization Plans, and DoD Project Reliance
agreements. This program is dedicated to conducting proof-of-principle
simulations, field demonstrations, and test of non-system- and system-
specific technologies to meet specific military needs, and is, therefore,
appropriately funded in Budget Activity 3.

Primary in-house developers of the training systems part of this Program
Element include Simulation, Training and Instrumentation Command (STRICOM),
Orlando, FL; Army Research Laboratory (ARL); and NASA Langley, Hampton, VA.

The work in this Program Element is consistent with the Army Science and
Technology Master Plan (ASTMP), the Army Aviation Modernization Plan, and
DoD Project Reliance Agreements.

This is continuing work which is reviewed periodically, ensuring quality,
relevance, and priority.

RELATED ACTIVITIES:

This program adheres to DoD Project Reliance Agreements on Aeropropulsion and Air Vehicles (Rotary), with oversight and coordination provided by the Joint Directors of Laboratories, and Training Systems with oversight and coordination provided by the Training and Personnel Systems Science and Technology Evaluation Management Committee (TAPSTEM). Related concept exploration is conducted under PE 0602211A (Aviation Technology).

Efforts under this PE transition, provide risk reduction for, and lead into Demonstration/Validation and Engineering Development programs supported by PE 0603801A (Aviation - Advanced Development), PE 0604801A (Aviation-Engineering Development), and PE 0604270A (Electronic Warfare Development). In addition, this PE's deliverables provide technical support and technology transition to PE 0604223A (RAH-66 Comanche), PE 0604816A (Longbow), and PE 0203744A (Aircraft Modification/Product Improvement).

The Army participates in and with the following groups, organizations and programs for total coordination: the DoD Tri-Service Joint Technical Coordination Group for Munitions Development and Aircraft Survivability; Acoustical Society of American Standards, Committee on Acoustics Group for Aerospace Research and Development; Aircraft Instruments and Aircrew StationWorking Group; the NATO Military Agency for Standardization Air Armament Working Party; the Joint Integrated Avionics Working Group (JIAWG); Integrated High Performance Turbine Engine Technology (HPTET) Steering Committee; the Air Armament Working Party of NATO; the Army's Combined Arms Weapon System (TACAWS) Executive Steering Committee; and the Executive Steering Committee for the RPA Program. This participation enables the gathering of technical information and assets in determining the joint use and standardization of airborne weaponization items. The Army Munitions Research and Development Committee, an organization within the Office of theSecretary of Defense, functions to establish joint-Service requirements and the development of air munitions. International related activities are the Technical Cooperation Programs with Australian, Canadian and United Kingdom governments and Defense Development Share Plans. Formal Memoranda of Understanding (MOUs) and Data Exchange Agreements (DEAs) with various friendly nations are actively pursued to allow technology information exchange. There is no unnecessary duplication of effort within the Army or Department of Defense.

PAYOFF/UTILIZATION:

The payoffs of the MPTS portion of this Program Element include: a) a BDS-D ATD implementation architecture; and b) a SAFOR baseline for BDS-D ATD.

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PROJECT OVERVIEW

	95	96
PROJECT: DB39 ADVANCED DISTRIBUTED SIMULATIONS	$9.6M	$0.0M

PE: 0603003A AVIATION ADVANCED TECHNOLOGY

CONGRESSIONAL CATEGORY: TRAINING SYSTEMS

PROJECT SYNOPSIS:

This Project supports the Battlefield Distributed Simulation-Developmental (BDS-D) program and the Anti-Armor (A2) Distributed Interactive Simulation (DIS) program. In FY93, the A2 program was supported by PE 0603654A, Project D460. The BDS-D program simulation capabilities will be used for demonstrating and assessing advancements in distributed large-scale, networked, real-time, man-in-the-loop, upward-compatible simulation architectures, and emerging Tri-Service/industry standards and methods for representing battlefield behaviors through use of selective levels of simulation fidelity and network participation. The A2 program is intended to develop and demonstrate a Verified, Validated, and Accredited (VV&A) Distributed Interactive Simulation (DIS) capability to assess Anti-Armor weapon system virtual prototyping, concept formulation, requirements definition, effectiveness evaluation, and mission area analysis on a combined arms battlefield at the Battalion Task Force or Brigade level. The results of this evaluation will support virtual prototyping effectiveness analysis and make future weapon system improvements more timely, effective and affordable.

Further upgrades/development of simulators for DIS capability. Perform VV&A on all simulators.

This project will be completed at the end of FY95.

PAYOFF/UTILIZATION:

FY94 plans: a) completed development of Dead Reckoning methods and analysis simulation developers tool for DIS; b) development of Simulation Prototype Management Interface unit for DIS; c) upgraded DIS Cell Interface and Adapter units; d) incorporated unclassified algorithms and data for generic weapons class; e) completed ModSAF 1.2/SAF 4.33 comparison study summary report; f) development of Southwest Asia and Ft. Hood IOT&E area databases; g) development of repeatable VV&A process for simulators; h) development of SINCGARS radio simulator; i) upgraded simulators for DIS capability.

PROGRAM ELEMENT OVERVIEW

PE: 0603007A MANPOWER, PERSONNEL AND TRAINING ADVANCED TECHNOLOGY

FUNDING: FY95 $ 5.1M (FY96 PRESIDENT'S BUDGET)
                                  FY96 $ 4.8M (FY96 PRESIDENT'S BUDGET)

PE SYNOPSIS:

The objective of this Program Element (PE) is to demonstrate soldier-
oriented technologies to enhance soldier and unit performance. These
include: a) training strategies for simulation-based training; b) methods
that develop the knowledge and skills required for successful battle command
on the increasingly digitized battlefield; c) accurate behavioral models of
individual and unit warfighting performance for use in synthetic environ-
ments; d) optimized design of battle command staff groups for improved
command and control (C2); and e) a new selection and assignment technology
for better soldier-job matching to maintain warfighting capabilities in a
downsized Army.

These projects are dedicated to conducting proof of principal field demon-
strations and tests of system-specific technologies to meet specific
military needs, and are therefore, correctly placed in Budget Activity 3.

This PE is managed by the U.S. Army Research Institute for the Behavioral
Sciences (ARI), Alexandria, VA.

RELATED ACTIVITIES:

Work in this Program is consistent with the Army Science and Technology
Master Plan (ASTMP), the Army Modernization Plan, and Project Reliance.

PAYOFF/UTILIZATION:

The payoffs of this Program Element include: a) a model to predict the
consequences of changing MPT requirements on intelligence production ; b) a
civilian survey longitudinal database for use by the Department of the Army
to monitor Army civilian climate; and c) a performance assessment
methodology and guide for observers/controllers at the Joint Readiness
Training Center (JRTC).

PROJECT OVERVIEW

	95	96

PROJECT: A792   MANPOWER AND PERSONNEL $2.8M $2.3M

PE: 0603007A MANPOWER, PERSONNEL AND TRAINING ADVANCED TECHNOLOGY

CONGRESSIONAL CATEGORY: MANPOWER and PERSONNEL

PROJECT SYNOPSIS:

This Project demonstrates soldier-oriented technologies that will lead to improved Army personnel utilization, including enlisted, officers, civilians, and families. A major focus of the Project is on the human leader and decision-maker in evolving digitized, battle command systems. The research will also demonstrate new methods for identifying high-quality male and female enlistees, for assigning them to Military Occupational Specialties (MOS) that maximize total force readiness, and for retaining the most effective performers. It also develops and demonstrates behavioral science-based methods to achieve optimized designs of Army decision-making staff organizations. Other efforts will develop innovative, simulation-based methods for career-long leader development, e.g., to ensure that some of today's lieutenants and captains develop adequate knowledge and skills to become tomorrow's division commanders for the digitized battlefield. This Program supports the Manpower and Personnel Defense Technology Area.

Work on this element is coordinated with the Training and Doctrine Command (TRADOC) Battle Laboratories, and demonstration projects are integrated into the Battle Labs' Advanced Warfighting Experiments.

FY95 plans: a) prepare comprehensive recommendations for modifications to the selection, classification, reenlistment and promotion systems based on integration of Career Force and cost-effectiveness findings; b) integrate the Battle Command Training Program (BCTP) database and other performance data into the Combat Training Center's Warrior Information Network for analyses on battle command decision-making; c) develop job structuring guidebooks; d) develop improved selection procedures for Special Operations/Low-Intensity Conflict forces; e) develop tools and techniques to examine issues related to National Guard deployment in the Multinational Force of Observers (MFO) peacekeeping mission; f) funds will be reprogrammed for SBIR/STTR programs in accordance with the Small Business Innovation Research Program Reauthorization Act of 1992.

FY96 plans: a) develop improved soldier-job matching procedures by effectively utilizing psychomotor, spatial and temperamental measures; b) refine SF selection and assignment tests and procedures; c) provide preliminary finds on determinants of battle command performance and recommendations for decision aid evaluation methodologies to the Battle Command Battle Lab; d) develop methods for improving occupational analysis efficiency and accuracy.

PAYOFF/UTILIZATION:

FY94 specific accomplishments: a) constructed guidelines for organizational design with respect to leader span-of-control; b) identified links between peacetime performance and rated combat performance; c) developed MOS restructuring tools; updated procedures for administering selection and classification tests; d) developed a prototype career decisionaid for Special Forces (SF) recruits and families; e) assessed impact of family support measures during Operation Restore Hope.

This is continuing work which is reviewed periodically, ensuring quality, relevance, and priority.

PROJECT OVERVIEW

	95	96

PROJECT: A793   TRAINING SYSTEMS AND $2.3M $2.6M
EDUCATION

PE: 0603007A MANPOWER, PERSONNEL AND TRAINING ADVANCED TECHNOLOGY

CONGRESSIONAL CATEGORY: TRAINING SYSTEMS

PROJECT SYNOPSIS:

The objective of this Project is to demonstrate empirically based training
strategies, i.e., models for guiding the selection and application of
expensive training methods and resources. The focus of the research is how
to best use Distributed Interactive Simulation (DIS) training environments.
This program is predicated on research showing that the effectiveness of
Training Aids, Devices, Simulations, and Simulators (TADSS) is largely a
function of how they are used in training, including the adequacy of
performance measurement techniques and performance feedback methods.
Training strategies will be developed to integrate all three types of
simulation (live, virtual and constructive) into a seamless training
environment that will enhance training quality, relevancy and efficiency
for warfighting missions and for Operations Other than War (OOTW). In
future years, the project will develop training strategies for the
increasingly digitized battlefield. This research supports the TRADOC
Battle Labs, and will utilize emerging Battlefield Distributed Simulation-
Developmental (BDS-D) capabilities. This Program supports the Training
Systems Defense Technology Area.

FY95 plans: a) develop and test front-end analysis methodology for
determining critical peacekeeping and OOTW training requirements; b)
develop prototype automated training analysis and feedback system for
generating After Action Reviews (AARs) for DIS-based training; c) develop a
training strategy and prototype training program for the Close Combat
Tactical Trainer (CCTT); d) develop a methodology for designing combined
arms training strategies that are compatible with Battalion Level Training
Models; e) evaluate effectiveness of intelligent flight trainer for
training initial entry rotary-wing pilots; f) funds will be reprogrammed
for SBIR/STTR programs in accordance with the Small Business Innovation
Research Program Reauthorization Act of 1992.

FY96 plans: a) develop TADSS gunnery effectiveness database for RC units;
b) develop prototype armor maneuver training strategies; c) produce training
developer guidance for generating realistic tactical scenarios for CCTT; d)
develop OOTW mission performance measurement methodology; e) design a
preliminary aviation training strategy with an emphasis on low-cost,
part-task simulators and training devices.

PAYOFF/UTILIZATION:

FY94 specific accomplishments: a) Upgraded Unit Performance Assessment
System (UPAS) was demonstrated and transferred to the Simulation, Training

and Instrumentation Command (STRICOM) and TRADOC; b) developed prototype computer-based battalion staff training program; c) developed a device-based tank gunnery training strategy for Reserve Components (RC) units; d) conducted a detailed training requirements analysis of the most Critical Combat Functions (CCF) for armored battalion task forces; e) evaluated the training effectiveness of low-cost, aviation part-task training devices; f) developed prototype simulation-based training programs for National Guard Armor units.

PROGRAM ELEMENT OVERVIEW

PE: 0604715A NON-SYSTEM TRAINING DEVICES - ENGINEERING DEVELOPMENT

FUNDING: FY95 $ 37.7M (FY96 PRESIDENT'S BUDGET)
                                    FY96 $ 43.2M (FY96 PRESIDENT'S BUDGET)

PE SYNOPSIS:

Program Element funds engineering development of Non-System Training Devices
to support force-on-force training at the Combat Training Centers (CTC),
general military training, and training on more than one item/system, as
compared with system devices, which are developed in support of a specific
item/weapon system.

Training devices and training simulations provide force multipliers that
can improve combat effectiveness by providing realistic training while
helping to control rapidly escalating costs. Training devices maximize the
transfer of knowledge, skills and experience from the training situation to
a combat situation.

Force-on-force training at the National Training Center (NTC), Ft. Irwin,
CA; Joint Readiness Training Center (JRTC), Ft. Chaffee, AR; and Combat
Maneuver Training Center (CMTC), Hohenfels, West Germany; and battlestaff
training in Battle Command Training Program (BCTP) will provide increased
combat readiness through realistic collective training in low-, mid-, and
high-intensity scenarios.

Project DC82, Louisiana Maneuvers, is intended to energize and guide the
restructuring of the Army while simultaneously keeping it combat-ready for
any contingency.

Project DC91, Distributive Interactive Simulations (DIS), includes
engineering development of techniques and technology for DIS and related
simulations and simulator efforts.

Project D241, Non-System Training Devices-Combined Arms, develops
simulation training devices for Army-wide use, including the CTCs.

Project D396, Tactical Simulations, is an intelligence simulation/driver
for both training (intelligence driver for Corps Battle Simulation (CBS))
and testing.

Project D573, STRICOM/Naval Air Warfare Center Training Systems Division
(NAWCTSD) Support, funds in-house costs of Project support by U.S. Army
Simulation, Training and Instrumentation Command (STRICOM) and NAWCTSD.

Projects D241, D396, and D573 in this Program Element support research
efforts in the engineering and manufacturing development phases of the
acquisition strategy; and are therefore, correctly placed in Budget Five
Activity.

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RELATED ACTIVITIES:

PE 0602727A (Non-System Training Device Technology); PE 0604780A (Combined Arms Tactical Trainer).

To preclude duplication of effort, this Project is closely coordinated with other Services through Training and Personnel Technology conferences, a Joint-Service Technical Coordinating Group, worldwide staffing of Training Devices Requirements, and collocation of STRICOM with the Naval Air Warfare Center Training Systems Division in Orlando, FL.

There is no unnecessary duplication of effort within the Army or DoD.

PAYOFF/UTILIZATION:

The payoffs of this Program Element include engineering development efforts for a variety of training devices and battle simulation systems which will provide realistic, effective, and economical training in marksmanship, gunnery, air defense, and Nuclear, Biological, and Chemical (NBC) warfare.

PROJECT OVERVIEW

		95	96
PROJECT: D241	NON-SYSTEM TRAINING DEVICES COMBINED ARMS	$24.7M	$31.1M

PE: 0604715A NON-SYSTEM TRAINING DEVICES - ENGINEERING DEVELOPMENT

CONGRESSIONAL CATEGORY: TRAINING SYSTEMS

PROJECT SYNOPSIS:

This Project is used to develop prototype training devices to support Combined-Arms (Infantry, Armor, Aviation, Air Defense, Artillery, Engineer, Chemical, and Support troops) training and multi-system training within the Army, to include the Reserve Components. JANUS is a simulation to train commanders and battle staff in the execution of close battle operations.

Corps Battle Simulation (CBS) is the Army's standard command and staff training simulation at the corps/division level. Combat Service Support Training Simulation System (CSSTSS) is a training simulation which supports training at battalions through echelons-above-corps levels to provide the level of detail required to train logistics commanders and staffs. CSSTSS will be linked to CBS to provide integrated maneuver and logistics training. Distributed Interactive Simulation (DIS) will allow training simulations representing different weapons systems and command levels at geographically-dispersed locations to interact with one another in real time to provide more realistic combined-arms training. Warfighters Simulation (WARSIM) will be the next generation battle simulation to replace CBS and Brigade/Battalion Simulation (BBS). WARSIM will utilize current technology to efficiently provide training support and linkage to other simulations and simulators. WARSIM will comply with DIS standards and open architecture to meet the Army's training requirements into the next century.

Multiple Integrated Laser Engagement Simulation 2000 (MILES 2000) will provide additional weapon system capabilities during tactical engagement exercises. Simulated Area Weapons Effect Radio Frequency (SAWE-RF) simulates area weapons effects using distributed processing techniques and a radio frequency communications system. The Area Weapon Scoring System (AWSS) is a standard objective scoring system for aviation crew gunnery qualifications. The Intelligence Electronic Warfare Tactical Trainer (IEWTPT) will provide the initial capability for sustainment training for military intelligence units. Additionally, this Project provides for the development of maintenance simulators for many Army weapon systems. This Project funds the development of training devices, simulators, simulations and instrumentation for the Combat Training Centers (CTCs) to include Opposing Forces Surrogate Vehicles (OSVs) for displaying doctrinally correctthreat at the CTCs. The Air Ground Engagement System II (AGES II) will permit the inclusion of aviation assets in MILES tactical engagement exercises. Devices developed will enable the Army to train units collectively to obtain synergistic results through the employment of weapons and support systems in their respective battlefield roles. The Fire

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Support Combined Arms Tactical Trainer (FSCATT) provides for initial and sustainment gunnery training, and can be linked as part of the CATT family. FSCATT is designed as the Army's only defense acquisition pilot program IAW the Federal Acquisition Streamlining Act (FASTA).

FY95 plans: a) initiate development of CBS 1.5.3; b) complete development of AGES II upgrades, CSSTSS, FSCATT Phase I, and devices, simulators and simulations to support training at the CTCs (i.e., NTC, JRTC, CMTC, and BCTP) to include completing development of CTC-IS interface AGES II); b) continue architecture development and initiate Engineering manufacturing Development for WARSIM 2000; c) continue limited BBS enhancements; d) continue enhancements of BCTP AAR for Armywide CBS; e) complete development of M113 OSV, and CBS 1.5.2, and GUARDFIST I, f) SBIR/STTR.

FY96 plans include: a) JANUS development of battle focus trainer enhancements to existing software baseline; b) continue limited BBS enhancements, development of the CSSTSS, and development of devices, simulators and simulations to support training at the NTC, JRTC, CMTC and BCTP; c) complete CBS 1.5.3 and continue limited enhancements to CBS; d) exercise contract option for Prime WARSIM EMD; d) complete development of FSCATT Phase I; e) initiate SAWE-RF downsized man worn system, and development of IEWTPT.

PAYOFF/UTILIZATION:

FY94 specific accomplishments: a) initiated development of MILES II for crew served and individual weapons, FSCATT Phase I, CBS 1.5.2, STOW-E, architecture and test bed for WARSIM 2000; After Action Review system for BCTP; b) initiated enhancement of After Action Report (AAR) for Armywide CBS use; c) continued limited BBS enhancement; d) continued development of AGES II upgrades, M113/BMP-2 Opposing Force Surrogate Vehicle, CSSTSS, devices, simulators and simulations to support training at the National Training Center (NTC), Joint Readiness Training Center (JRTC), and BCTP, and CBS 1.5; e) initiated development of AGES II (AH-64) interface with CTC instrumentation; f) completed testing of Precision Gunnery Training System; and GUARDFIST I; g) completed Initial Operational Test 7 Evaluation of SAWE-RF; h) provided support of Louisiana Maneuvers exercises and CINC training initiatives; i) provided system engineering, configuration management, hardware maintenance and daily operation of the core DIS facilities.

PROJECT OVERVIEW

	95	96

PROJECT: D396   TACTICAL SIMULATION $3.4M $2.1M

PE: 0604715A NON-SYSTEM TRAINING DEVICES - ENGINEERING DEVELOPMENT

CONGRESSIONAL CATEGORY: TRAINING SYSTEMS

PROJECT SYNOPSIS:

This Project funds development and testing support of Tactical Simulation (TACSIM).

FY95 plans: a) complete TACSIM 2.1.6 development; b) complete TACSIM/CBS development for CBS; c) initiate TACSIM 2.1.7 development; d) continue TACSIM/ALSP interface development; e) initiate development of Warfighter's Simulation (WARSIM) intelligence capability; f) SBIR/STTR.

FY96 plans: a) include TACSIM 2.1.7 development; b) complete TACSIM/ALSP interface development; c) initiate TACSIM 2.1.8 development/compatibility with CBS; d) continue development Warfighter's Simulation (WARSIM) intelligence capability.

PAYOFF/UTILIZATION:

FY94 specific accomplishments: a) completed TACSIM version 2.1.5 development; b) initiated TACSIM 2.1.6 development; c) continued TACSIM/CBS development for CBS; d) initiated TACSIM/Aggregate Level Simulation Protocol (ALSP) interface development.

PROJECT OVERVIEW

	95	96

PROJECT: D573   STRICOM AND NAVAL $9.6M $10.0M
TRAINING SYSTEM CENTER
SUPPORT

PE: 0604715A NON-SYSTEM TRAINING DEVICES - ENGINEERING DEVELOPMENT

CONGRESSIONAL CATEGORY: TRAINING SYSTEMS

PROJECT SYNOPSIS:

This Project funds Simulation Training and Instrumentation Command
(STRICOM) personnel and appropriate Army share of the operating costs of
the Naval Air Warfare Center Training Systems Division (NAWCTSD) through
inter-Service support agreement which is reviewed annually.

FY95 plans: a) Fund STRICOM personnel; b) fund NAWCTSD support; and c) fund
concept formulation.

FY96 plans: a) Fund STRICOM personnel; b) fund NAWCTSD support; and c) fund
concept formulation.

PAYOFF/UTILIZATION:

FY94 specific accomplishments: a) funded STRICOM personnel; b) funded
NAWCTSD support; and c) funded concept formulation.

NAVY Program Element and Project Synopses

PROGRAM ELEMENT OVERVIEW

PE: 0601153N   DEFENSE RESEARCH SCIENCES, SUBELEMENT 42: COGNITIVE AND
NEURAL SCIENCES

FUNDING: FY95 $ 38.3M   (FY96 PRESIDENT'S BUDGET)
                                      FY96 $ 39.8M   (FY96 PRESIDENT'S BUDGET)

PE SYNOPSIS:

This Program sustains U.S. Naval scientific and technological superiority;
provides new concepts and technology options for the maintenance of Naval
power and national security; and provides the means to avoid scientific
surprise, while exploiting scientific breakthroughs.

The Program responds as noted below to the Science and Technology (S&T)
requirements from the Department of the Navy (DoN) Joint Mission
Areas/Support Areas (JMA/SA) and enables the technologies that could
significantly improve Joint Chiefs of Staffs's Future Joint Warfighting
Capabilities. It also seeks to exploit new science opportunities relevant
to long term Naval requirements. The Office of Naval Research (ONR)
responds to requirements through major research thrusts in Ocean Sciences,
Advanced Materials, Information Sciences, and the Sustaining Program. These
efforts are part of an integrated DoN S&T process, initiated by ONR in 1993.

Program justification is described in terms of fundamental research related
to the JMA requirements, followed by current accomplishments and plans.

This Program responds to the Joint Strike JMA through research leading to
better structural materials to increase platform survivability; automated
target recognition algorithms to improve identification of friend or foe,
and to help improve real-time targeting under camouflage conditions; and
physics and chemistry foundations for improved multispectral, all-weather
sensors and electronics. Responses to the Joint Littoral JMA, which covers
forward operations in high-threat coast regions, involve knowledge of
near-shore ocean and atmospheric circulation and optical transmission to
improve mine detection and removal; special operations capabilities and
submarine detection; novel structural materials for better ship damage
tolerance; data fusion research to integrate environmental prediction
products into Command, Control, Communications, Computers and Intelligence
(C4I) systems; and new concepts in batteries and propellants for improved
torpedo performance. The Program responds to requirements in the Joint
Surveillance JMA with research into advanced materials for improved sensors
and electronics; better signal processing for automated target
recognition allowing rapid ship self-defense; and identifying relocatable
targets. Requirements of the Joint Space Electronic Warfare
(SEW)/Intelligence JMA are matched by research to extend our knowledge of
ocean and atmospheric properties, allowing sensors to operate more
effectively under varied weather conditions; and by network and data
studies to address real-time, all-weather surveillance and targeting, with
short revisit times using multiple high capacity data links. Research into

improved aerodynamic shapes for high endurance surveillance responds directly to requirements of the Strategic Deterrence JMA. Research in response to the Readiness and Support Infrastructure JSAs includes developing knowledge of acoustic/boundary interactions for improved navigation capabilities in poorly charted areas; exploring longer service life materials for reduced logistics; and investigating chemical and biological processes for clean handling of shipboard waste. Finally, cognitive research leading to more efficient and cost-effective training techniques responds to the Manpower, Personnel, and Shore Training JSA.

RELATED ACTIVITIES:

PE 0602111N (Air Surface Weapons Technology)
PE 0602121N (Surface Ship Submarine HM&E Technology)
PE 0602122N (Aircraft Technology)
PE 0602234N (Materials, Electronics and Computer Technology)
PE 0602314N (Undersea Warfare Surveillance and Weapons Technology)
PE 0603207N (Air/Ocean Tactical Application)
PE 0603785N (Combat Systems Oceanographic Performance Assessment)
PE 0601152N (In-House Laboratory Independent Research)
PE 0601102A (Army Defense Research Sciences)
PE 0601102F (Air Force Defense Research Sciences)

Activities are coordinated through Tri-Service 6.1 Reliance Scientific Planning Groups.

PAYOFF/UTILIZATION:

The payoffs of this Subelement are to sustain Naval scientific and technological superiority, and to provide new concepts and technological options for maintenance of Naval power and national security.

PROJECT OVERVIEW

		95	96

PROJECT: R2161   INFORMATION SCIENCES $38.3M $39.8M

PE: 0601153N DEFENSE RESEARCH SCIENCES, SUBELEMENT 42: COGNITIVE AND NEURAL
             SCIENCES

CONGRESSIONAL CATEGORY: HUMAN FACTORS

PROJECT SYNOPSIS:

FY95 plans: a) Information Sciences will respond to the Readiness JSA
through developing hybrid learning techniques for humans and artificial
systems, and virtual environment displays for spatial disorientation
training; and to the Precision Strike JMA by exploring the nonlinear
dynamics of noisy, complex neural systems to uncover principles leading to
novel sensors, controls, and robotics; b) sustaining programs will respond
to the Readiness JSA by investigating multi-domain simulation of ocean
structures to predict nonlinear behavior affecting their stability and
integrity.

FY96 plans: Information Sciences will respond to Joint Strike JMA
requirements by exploring algorithms using nonlinear inverse techniques to
detect weak signals amid clutter and jamming, multi-spectral and wideband
modulation algorithms to analyze the sensed field, and missile aimpoint
selection algorithms to improve performance of multi-spectral seekers.

PAYOFF/UTILIZATION:

FY94 specific accomplishments: Information Sciences responded to the Joint
Strike JMA by introducing a new algorithm for autonomous navigation, an
inverse algorithm for remote sensing of glaciers, and a new matrix-based
procedure for reverberation suppression and signal detection for improved
sonar system designs; to the Joint Littoral JMA with a new method for
elasticity computations that are key to detection of mine-like objects; and
to the Manpower and Personnel JSA with a geometric system to construct and
manipulate objects in next generation virtual environment simulator.

PROGRAM ELEMENT OVERVIEW

PE: 0602233N READINESS, TRAINING AND ENVIRONMENTAL QUALITY TECHNOLOGY

FUNDING: FY95 $ 17.7M (FY96 PRESIDENT'S BUDGET)
                                      FY96 $ 19.4M (FY96 PRESIDENT'S BUDGET)

PE SYNOPSIS:

The objective of this Program Element is to provide generic enabling technologies in support of all Joint Mission/Joint Support Areas (JMAS/JSAs), in particular the JSAs for Readiness, Support and Infrastructure; Manpower and Personnel; and Shore Training. These three JSAs encompass requirements for manning, operating, and maintaining fleet assets, and for providing the necessary training, facilities, and equipment to maintain operating forces in a high state of readiness.

The Program Element also supports the Joint Warfare Strategy "From the Sea" as well as three of the "Top Five" Future Joint Warfighting Capabilities identified by the Joint Chiefs of Staff - in particular, capabilities related to: a) conducting limited-objective warfare (e.g., technology for enhancing the performance of special forces personnel, aiding decision-makers in highly ambiguous situations, and improving casualty care); b) promptly engaging regional forces worldwide (e.g., technology for deployable training and mission rehearsal, and for logistics support of ambiguous landings); and c) countering weapons of mass destruction (e.g., technology for responding to chemical and biological threats).

Personnel, Training and Human Factors technologies enhance the Navy's ability to select, assign, and manage its people; to train effectively in classroom settings, in simulated environments, and while deployed; and to operate effectively in the complex, high stress, information-rich and ambiguous environments of modern warfare. Technology development in these areas responds to a variety of requirements, including: providing more affordable approaches to training and skill maintenance; managing the force efficiently and maintaining readiness with fewer people and smaller budgets; providing warfighting capabilities optimized for low intensity conflict and littoral warfare; and operating and maintaining increasingly sophisticated weapons systems.

The in-house developing organizations responsible for this program are the Naval Air Warfare Center/Training Systems Division and the Navy Personnel Research and Development Center.

Funding and Project information indicated includes only the Manpower, Personnel, Training and Human Factors portion of this Program Element.

RELATED ACTIVITIES:

This Program Element adheres to Tri-Service Reliance Agreements on Training Systems, Manpower and Personnel, Human Systems Interface, Medical, CBD, Civil Engineering, and Environmental Quality. Oversight is provided by the

JDL, TAPSTEM, ASBREM, and Joint Engineers.

PAYOFF/UTILIZATION:

The payoffs of the MPT portion of this Program Element include: a) completed evaluation of a low-cost analysis and debrief system for air combat training; and b) completed development of a prototype desk-top simulator for training various aspects of radio navigation in a more cost-effective fashion.

PROJECT OVERVIEW

	95	96
PROJECT: RM33HF HUMAN FACTORS TECHNOLOGY	$6.7M	$7.6M

PE: 0602233N READINESS, TRAINING AND ENVIRONMENTAL QUALITY TECHNOLOGY

CONGRESSIONAL CATEGORY: HUMAN FACTORS

PROJECT SYNOPSIS:

The objective of the Tactical Decision-Making Under Stress (TADMUS) program
is to apply recent developments in decision theory, individual and team
training, and information display to the problem of enhancing tactical
decision quality under conditions of stress.

This will be accomplished by a cooperative program in human factors and
training involving two principal laboratories (NOSC and NTSC), as well as
other Navy, industrial, and academic organizations. The technology will be
demonstrated and evaluated in the context of anti-air scenarios, and
general principles will be developed that will be applicable to other
warfare areas.

The Program is comprised of five tasks. a) Task Definition and Measurement:
define the operational tasks, set up laboratories in which to study those
tasks, develop a strong performance measurement capability, and develop
knowledge of the decision-making processes for that operational
environment. b) Examination of Stress Effects on Decision-Making: select a
number of stressors for investigation, determine which stressors should be
used as approximations to actual combat stress, and determine how to
quantify their effects. c) Development of Decision-Support Principles:
produce an experimental decision support system and evaluate the prototype
in simulated tactical environments, initially in laboratory settings, and
later during at-sea exercises. Additional products of this task will be
general principles for advanced decision-support systems to enhance human
performance under stress. d) Development of Training and Simulation
Principles: develop and demonstrate a variety of individual and team
training strategies and techniques to minimize the adverse effects of
stress. Products of this task will include principles for overtraining
decision-making skills, training decision-makers in pattern recognition,
training interventions that will attenuate the effects of stress on team
performance, training leadership skills, and inducing stress during
training. e) Development of Display Principles: examine man-machine
interface concepts which maximize the effectiveness of tactical decision
aids under stressful conditions. Products of this task will include display
principles for predictive displays, situation assessment, option
generation, resolution of conflicting or ambiguous information, and
cognitive consistency among team members.

FY95 plans are to continue evaluation of decision support technology and
advanced team training strategies for tactical decision-making in ship air
defense, limited-objective warfare scenarios.

FY96 plans are to complete operational evaluations of team training strategies that will minimize the adverse effects of stress on decision-making performance.

PAYOFF/UTILIZATION:

FY94 accomplishments: a) initiated evaluation of experimental tools for facilitating collaborative tactical situation assessment by the Space and Electronic Warefare Commander and his team; b) continued development and evaluation of an experimental system designed to enhance human decision-making performance under conditions of high stress and ambiguity; and c) complete development of advanced data visualization techniques for rapid review of large volumes of undersea surveillance data, to reduce analysis time, facilitate manpower reductions and improve ASW decision support.

PROJECT OVERVIEW

	95	96

PROJECT: RM33MP   MANPOWER AND PERSONNEL $2.0M $2.0M
                          TECHNOLOGY

PE: 0602233N READINESS, TRAINING AND ENVIRONMENTAL QUALITY TECHNOLOGY

CONGRESSIONAL CATEGORY: MANPOWER and PERSONNEL

PROJECT SYNOPSIS:

The objective of this Project is to provide for the efficient means of
locating, recruiting, assigning, and managing all manpower resources in the
Navy. It includes research in personnel assessment, assignment, and
retention systems, procedures to motivate and utilize personnel, improved
systems for managememt information, and new force management models.
Performance gains from effectively selecting, assigning, and utilizing
personnel are likely to be substantial.

This Project will be composed of eighteen tasks within these thrust areas:
a) Force Management, Detailing, and Assignment; b) Testing Effectiveness;
c) Selection and Classification; and d) Personnel Readiness and Evaluation.

In FY95, plans are to initiate development of advanced techniques for
personnel classification, based on artificial intelligence technologies,
and to enhance readiness and retention by improving the Navy's ability to
match individuals to jobs.

In FY96 plans are to complete development and evaluation of a
mutli-criteria model for optimizing assignments in the face of complex and
conflicting assignment policies.

PAYOFF/UTILIZATION:

The goal of this Project is to maximize the performance of the Navy's
weapons and support systems by improving the quality, skill, and
capabilities of the human resources needed to operate and maintain them.
The ultimate goal is to ensure that the human components of Navy
organizations and weapons platforms are in a state of personnel readiness
and capable of sustaining this readiness.

In FY94, specific accomplishments included completing development of
personnel strength forecasting techniques to improve manpower planning and
policy decisions, thereby improving the Navy's ability to manage force
reductions with minimal impact on readiness.

PROJECT OVERVIEW

	95	96

PROJECT: RM33TS   TRAINING SYSTEMS $9.0M $9.8M
TECHNOLOGY

PE: 0602233N READINESS, TRAINING AND ENVIRONMENTAL QUALITY TECHNOLOGY

CONGRESSIONAL CATEGORY: TRAINING SYSTEMS

PROJECT SYNOPSIS:

The objective of this Project is to improve the Navy's ability to train personnel effectively, rapidly, and economically.

This objective corresponds to training systems technology goals, such as developing state-of-the-art technology for: computer-based intelligent training systems; communication and problem-solving skills; individual and group performance measurement; and cost-effective simulators and training devices.

FY95 plans: a) initiate the development of mathematical modeling techniques for training resource allocation, to optimize the scheduling and management of finite Navy training assets; b) continue development of computer-based dynamic visual-spatial tests that can result in improved job performance, fewer training failures, and less equipment downtime; c) complete development of algorithms to simulate multi-element/beam sonar processing for more cost-effective air and surface ASW training systems; and d) complete development of techniques to identify, measure and train aircrew coordination skills in order to enhance mission effectiveness and safety.

FY96 plans: a) initiate development of a virtual environment locomotor interface to permit the training of tasks requiring movement within large work areas; and b) initiate development of enhanced measures of effectiveness sufficiently sensitive for use in determining how training interventions affect operational readiness.

PAYOFF/UTILIZATION:

FY94 specific accomplishments: a) developed improved tactile and force sensors and displays for deployable training devices and for enhanced control of teleoperated systems; b) developed and evaluated active sonar simulation techniques to improve training for shallow water antisubmarine warfare (ASW) and mine detection and recognition; and c) developed high-performance special-purpose simulation co-processor concepts to reduce the costs of high fidelity training devices.

PROGRAM ELEMENT OVERVIEW

PE: 0603707N MANPOWER, PERSONNEL, AND TRAINING ADVANCED TECHNOLOGY
              DEVELOPMENT

FUNDING: FY95 $ 18.5M (FY96 PRESIDENT'S BUDGET)
                                  FY96 $ 17.8M (FY96 PRESIDENT'S BUDGET)

PE SYNOPSIS:

This Program Element (PE) supports the Joint Support Areas for Manpower and
Personnel, Shore Training, and Readiness, Support and Infrastructure; it
also supports the Joint Mission Area assessments for most warfare areas,
and the Future Joint Warfighting Capabilities identified by the Joint
Chiefs of Staff. It develops technologies that enable the Navy to: select,
assign and manage its people; train effectively in classroom settings, in
simulated environments and while deployed; and operate and maintain complex
weapon systems. It consists of the following technologies:

a) Air and Ship Human Factors Engineering: These Projects develop
information management techniques, advanced interface technologies, and
decision support systems, all of which help ensure that complex systems
will be operated and maintained effectively, with fewer human-induced
errors, and with greater safety.

b) Manpower and Personnel: This Project provides Navy personnel system
managers with the ability to choose and retain the right, people and to
place them in jobs that best use their skills, training, and experience.
Fleet readiness can be enhanced and personnel costs reduced via such
technologies as modeling, mathematical optimization, advanced testing,
statistical forecasting, and human performance measurement.

c) Education and Training Development: This Project focuses on the
acquisition and maintenance of complex skills through individual and team
training. It improves training efficiency and effectiveness by applying
operations research and instructional, cognitive, and computer sciences to
the logistics, development, delivery, evaluation, and execution of
training.

d) Simulation and Training Devices: This Project improves mission
effectiveness and safety by applying both simulation and instructional
technology to the design of training systems. This Project develops and
evaluates systems to improve advanced training, skill maintenance and
mission rehearsal capability.

e) Interactive Multi-Sensor Analysis Training Technology: This Project will
develop and demonstrate training technology to enhance sensor system
employment and tactical skills in undersea warfare, with emphasis on
conceptually-oriented approaches that will be applicable to other areas of
Navy training.

The in-house agencies responsible for this work are: Naval Air Warfare

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Center, Orlando, FL, and Patuxent River, MD; Air Force Armstrong Lab, Williams AFB, AZ; Naval Research Lab; Navy Personnel Research and Development Center; Naval Command, Control and Ocean Surveillance Center, RDT&E Division; and Armstrong Laboratories.

RELATED ACTIVITIES:

This Project adheres to Tri-Service Reliance Agreements on Training Systems technology. Work is related to, and fully coordinated with, efforts in: a) PE 0601152N, In-House Lab Independent Research; b) PE 0601153N, Defense Research Sciences; c) PE 0602233N, Readiness, Training and Environment Quality Technology; d) PE 0603216A, Synthetic Flight Simulator Devices Development; and e) PE 0603227F, Personnel, Training and Simulation Technology

PAYOFF/UTILIZATION:

The payoffs of this Program Element include: a) development and evaluation of new techniques for human factors-based system design; b) improved ability for the Navy to forecast manning requirements; c) application of automation, instructional and cognitive sciences to training development; and d) demonstration of simulator and training technology to improve training capability.

PROJECT OVERVIEW

			95	96
PROJECT: L0542		AIR HUMAN FACTORS ENGINEERING	$1.0M	$1.1M

PE: 0603707N MANPOWER, PERSONNEL AND TRAINING ADVANCED TECHNOLOGY

CONGRESSIONAL CATEGORY: HUMAN FACTORS

PROJECT SYNOPSIS:

This Project develops and demonstrates advanced Human Factors Engineering
(HFE) technology to improve the integration of the human in Navy airborne
weapons systems. General goals of the Project are to enhance human
performance effectiveness, reduce design-induced critical human performance
errors, and accelerate insertion of advanced HFE technology into existing
and new weapons systems. Prior work in this Project has focused on
developing and refining a decision-aiding architecture, and the
Knowledgeable Observation, Analysis-Linked Advisory System (KOALAS), which
is unique in that it allows for both data-driven, as well as operator,
inputs into the decision-making process.

The current task focuses on the problem of integrating information from
multiple aircraft to enhance performance in the multidimensional battle
space. Since there are unique data flow requirements for each aircraft,
there are risks associated with realizing the full potential of the Navy's
proposed SONATA initiative. The purpose of the current task is to mitigate
these risks by providing iterative demonstrations of our ability to
effectively combine and present information to the operator, and to develop
the guidelines and specifications for each platform necessary for the
effective implementation of this technology.

This Project supports Joint Chiefs of Staff Future Joint Warfighting
Capabilities and is responsive to numerous warfighting requirements
identified in Joint Mission Area (JMA) assessments. Specific JMAs and
associated requirements include the following:

a) Joint Strike: requirement for near-real time targeting is addressed by
developing and refining a data fusion architecture which optimizes
decision-making; requirement for precision weapons delivery is addressed by
developing optimized pilot displays.

b) Joint Space & Electronic Warfare/Intelligence: requirements for
additional throughput capability to process large volumes of data, and for
tactical communication links with high data rates and more diverse
platforms, are being supported by developing the capability to effectively
present information from multiple sources to operators of diverse
platforms; and c) Joint Littoral/Strategic Sealift, and Strategic
Deterrence: requirements for dealing with complex tactical situations,
including rapid switching among target sets, are addressed by developing
specifications for enhanced displays which minimize complexity.

FY95 plans: a) demonstrate enhanced situational awareness and tactical response in objective warfare scenarios for inter-platform simulation of F-14D, F/S-18, S-3 and ES-3, and b) document results of evaluation and complete Human Factors specification and systems integration requirements for the IMMSI architecture.

FY96 plans for new starts: a) develop capability for the tactical decision-maker to collect and process communications data delivered in various formats and in quantities exceeding human limits; b) develop measures of effectiveness criteria for testing intelligent control systems; and c) complete development of operational scenarios to demonstrate advantages of adaptive automation.

The in-house agencies managing this Project are: Naval Air Warfare Center, Warminster, PA, and Patuxent River, MD; Naval Research Laboratory, Washington, DC.

PAYOFF/UTILIZATION:

FY94 specific accomplishments: a) initiated development of ES-3 simulations; b) initiated F/A-18 and F-14D simulation interface; and c) completed F/A-18 wing and lead simulation, and demonstrated improved performance resulting from more optimum use of Electronic Warfare assets; d)demonstrated a 50% increase in radar range for F-14D with use of KOALAS architecture; e) conducted Aircrew Systems Advsory Panel meetings to brief F-14D, F/A-18 and S-3 simulation work, and gather operational input from aircrew; f) continued investigation of crew-system integration issues related to Intelligent MultiPlatform MultiSensor Integration (IMMSI); and g) demonstrated objective HFE performance criteria for testing intelligent control systems.

PROJECT OVERVIEW

	95	96
PROJECT: L1770 MANPOWER AND PERSONNEL SYSTEMS	$3.5M	$3.9M

PE: 0603707N MANPOWER, PERSONNEL AND TRAINING ADVANCED TECHNOLOGY

CONGRESSIONAL CATEGORY: MANPOWER and PERSONNEL

PROJECT SYNOPSIS:

This Project supports the Manpower and Personnel Joint Area by responding to requirements for technologies that will: maintain or improve fleet readiness, while reducing personnel end strength; enable the Navy to manage the force effectively and efficiently; and optimize the selection and assignment of personnel to highly demanding jobs. The major goals are to ensure: the Navy has a force that is flexible, integrated, and responsive; skilled personnel are available to handle complex weapons systems when needed; and that small forces will have greater capabilities by placing the right person in the right job at the right time. The program supports the delivery of new technologies in modeling, mathematical optimization, advanced testing, statistical forecasting, and human performance measurement.

FY95 plans for new starts: the design of alternative measures of readiness for operational units and summary level measures; and conduct feasibility assessment of developing a resources-to-readiness impact model to relate changes is resources to changes in readiness. FY95 plans for continuations: a) evaluate the ability of the assignment policy trade-off-system to prove that policy goals are realistic, and quantify the tradeoffs among policies, such as moving costs, billet gapping and skill match; and b) design a decision support system that improves the accuracy of enlisted accession, training, retention, promotion and strength projections by integrating the management of recruiting, delayed entry program, and initial skill training pipelines; design an enlistment incentive management system to improve use of available recruit training seats and recruit financial incentives. FY95 plans for completions: a) development of a computer-based testing methodology for identifying test-takers who are deliberately trying to fail; assess validity of dynamic spatial tests; b) test, evaluate and demonstrate the accuracy and skill allocation ability of the Medical Manpower Tradeoff Analysis Model; c) development and validation of the QOL socioeconomic model to predict increases in retention and readiness in response to varying levels of OQL support; and d) test and evaluate the impact of computer-based technology enhancements on detailing efficiency andeffectiveness.

FY96 plans for new starts: a) determine feasibility of simulating effects of changes in job classification criteria on skill manning levels and on representation of key demographic groups across job categories; and b) evaluate alternative technologies for application to reserve strength planning; design models to project effect of changes in USN policies on USNR populations. FY96 plans for continuations: a) test and evaluate

alternative measures of readiness. Design resources-to-readiness impact model to relate changes in resources (dollars, people, training) to changes in fleet readiness; and b) design and test alternative econometric models for allocating distribution impacting pays, such as sea pay, sub-pay and hazardous duty pay, to skill groups; develop econometric models for allocating retention impacting pays and bonuses, given new Navy skill categories and career paths. FY96 plans for completions: a) test and evaluate the assignment execution monitoring system to measure policy compliance and to provide feedback for corrective action; b) conduct technology impact demonstration on assignment policy tradeoff system; c) develop a decision support system that integrates the management of recruiting, delayed entry program, enlistment incentives, initial skill training and enlisted strength planning to improve ability of these systems to respond to each other; and d) develop recruit attrition and advancement forecasting models; incorporate into enlisted strength policy analysis model; test and evaluate resulting system in operational setting.

PAYOFF/UTILIZATION:

FY94 specific accomplishments: a) developed a Delayed Entry Program decision support system to control the timing and mix of new accessions; b) designed and developed prototype enlisted strength policy analysis model to produce compatible short and long-term recruiting, strength, and retention plans and policies; and developed detailed projection models to forecast monthly retirements, losses and gains to support strength plan monitoring; and c) developed and demonstrated an assignment policy monitoring model and the associated computer-based technology improvements to support the assignment decision process. FY94 completions: a) developed scoring system and screening techniques to ensure quality of personnel adequate to operate under expected conditions, and to find flexible and adaptable personnel who are also creative and innovative; b) completed development of peacetime and mobilization medical manpower models at the detailed skill level; and c) demonstrated Quality of Life (QOL) Predictive Model that explains Navy member and family satisfaction and organizational outcomes, in order to determine the impact QOL activities such as Family Service Centers have on retention and readiness.

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PROJECT OVERVIEW

	95	96

PROJECT: L1771   SHIP HUMAN FACTORS $2.1M $2.1M
                            ENGINEERING

PE: 0603707N MANPOWER, PERSONNEL AND TRAINING ADVANCED TECHNOLOGY

CONGRESSIONAL CATEGORY: HUMAN FACTORS

PROJECT SYNOPSIS:

The goal of this Project is to improve ship, task force and battle group
operations by developing human factors technology for incorporation into
operational systems and training programs. This technology is designed to
reduce training and personnel requirements and to enhance mission
performance in such areas as global surveillance, joint operations, mission
planning, data fusion and Command and Control Warfare. The Project supports
Joint Chiefs of Staff Future Joint Warfighting Capabilities, as well as
requirements in several Joint Management Areas, including: Joint Space and
Electronic Warfare/Intelligence (e.g., displays for integrating information
from multiple sources); Joint Littoral/Strategic Sealift (e.g., aiding
decision-makers in complex tactical situations under stressful conditions);
and Joint Surveillance (e.g., displaying information in formats optimized
for the needs of different users).

FY95 plans for new starts: a) complete information requirements analysis
for the newly created position of Command and Control Warfare Commander
(C2WC); b) determine prototype display formats, informaton management
system and collaborataive decision-making needs; and c) coordinate
development effort with Command and Control Warfare Center, San Diego.
Continuing efforts in FY95: a) conduct usability studies to identify
strategies Combat Informaton Center (CIC) operators use when selecting and
changing VCR display filters; b) conduct studies to determine optimal
combinations of VCS symbol sets and coding dimensions (e.g., blinking,
strobing, color saturation) and propose VCS design guidelines based on
research findings; c) compare effectiveness of software - and input
device-controlled interface for operating CIUs to existing shipboard CIU
design; and d) develop, test and evaluate advanced user interface
technologies (e.g., 3-D audio) to improve CIC operator alerting and warning
systems; prepare design guidelines for improved audio alerts and alerting
mechanisms based on research findings. To be completed in FY95 is the
overall integration of DRO anchor desk within the USCINCPAC, as well as
within wide-area network demonstrations conducted among the various Unified
Commands.

Plans for FY96 include a new start to conduct information and display
requirements analysis for introduction of personal digital assistants
(PDAs) to remote joint task force staffs to enhance on-situation
assessment and monitoring of overall plan execution. Plans for FY96 also
include continuing development of all prototype display formats,
collaborative linkages and information management systems for the C2WC. In
addition, plans in FY96 are to complete: a) linking TAC-3 computer equipped

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with advanced human-system integration tools and techniques to a real-time Navy tactical database; b) conducting man-in-the-loop testing and evaluations of the above tools and techniques to validate their utility in the context of a real-time scenario involving multiple CIC watchstanders; and c) transitioning Advanced Information Management Evaluation and Demonstration software products to real-world Navy TAC systems; ensuring all transitioned software complies with TAC approved X-Window and Motif design standards.

PAYOFF/UTILIZATION:

FY94 specific accomplishments: a) developed method for minimizing storage requirements and speed of accessing NATO STANAG 4420 and color-coded NTDS tactical symbols on TAC-3 computer systems; b) completed information display requirements analysis for integrating console intercom unit (CIU) switches and controls with operator's tactical display and console input devices; c) developed network protocols allowing Macintosh-based simulation driver software to interface directly with TAC-3 computer systems; d) completed test plan for comparing the effectiveness of variable coded symbology (VCS) to existing ACDS Block 1 track filtering methods; e) coordinated ongoing development of man-machine interface for the Disaster Relief Operations (DRO) anchor desk with both regional and national headquarters of Federal Emergency Management Agency as well as, US, Commander in Chief, Pacific (USCINCPAC). Components of the DRO anchor desk have been successfully demonstrated in two hurricane exercises, one for USCINCPAC, one for the State of Hawaii; f) added significantly new analytic capabilities to the Analysis of Multiple Course of Action decision support system; and g) completed requirements analysis and evaluation criteria for use of groupware tools within the Operational Planning Team. Hardware procurement should be complete by the end of FY94.

PROJECT OVERVIEW

	95	96
PROJECT: L1772 EDUCATION AND TRAINING DEVELOPMENT	$5.8M	$5.0M

PE: 0603707N MANPOWER, PERSONNEL AND TRAINING ADVANCED TECHNOLOGY

CONGRESSIONAL CATEGORY: TRAINING SYSTEMS

PROJECT SYNOPSIS:

This Project addresses requirements in the Shore Training Joint Support Areas by focusing advanced technology on the acquisition and maintenance of complex skills through both individual and team training. It applies operations research and instructional, cognitive, and computer sciences in order to address requirements for improving: a) training throughout, efficiency and affordability necessary for "right-sizing" both the operational forces and the training infrastructure; b) the effectiveness of training for increasingly complex weapons systems employed in littoral warfare, under fast-paced and stressful conditions, and with limited opportunities for "real-world" practice; and c) training assessment and training system feedback capabilities for maximizing training responsiveness to operational requirements.

FY95 new start plans include to design methodology to measure quantitatively combat readiness using standardized, valid and reliable measures of effectiveness (MOE's) for battle groups, platforms and weapon subsystems with links to both team and individaul training. FY95 continuations: a) evaluate initial multi-media curriculum authoring and training delivery system prototype that enables rapid development and revision of cirricula and that capitalizes on the increasing availability of electronic data (e.g., Interactive Electronic Technical Manuals, Navy Paperless Ship), b) continue development of Interactive Multisensor Analysis Training technology for Undersea Warfare to aid tactical visualization and control and expand emphasis on technologies which address the problems of skill degradation, and c) continue development and begin evaluations of training seat reservation, school seat allocation, and course scheduling system for more efficient training troughput and increased fleet readiness. FY95 completions include the demonstration and evaluation of enhanced interactive video-teletraining for providing "hands-on" and behavior-oriented training from primary delivery site to multiple remote sites.

In FY96, plans for new starts include begin design of ashore/afloat interactive training prototype incorporating hypermedia and intelligent tutoring to enable individualized training, increased student achievement, and reduced instruction time and training costs. Continuation efforts in FY96 include: a) desisgn MOE's system providing both descriptive and diagnostic information at multple levels (e.g., individual, team, weapons systems, battle group) that links training resources and effectiveness to operational readiness, and b) continue development and demonstration of Interactive Multisensor Analysis Training system for Undersea Warefare,

including capability for classroom and for individual and team employment training. Tasks to be completed in FY96 include: a) complete development and demonstration of Navy training reservation system and course scheduling system, including yield management models and mission critical/readiness models to optimize the use of training pipeline resources and maximize responsiveness to fleet Navy Enlisted Classification requirements, and b) extend initial classroom automation prototype to include networked classroom capability and interfaces to interactive electronic technical manuals; assess total system; and develop specifications for implementaion.

PAYOFF/UTILIZATION:

FY94 specific accomplishments: a) continued development of an on-line training reservation system that will significantly reduce training systems costs and improve fleet training-related readiness, and b) continued development of prototypes for enhanced video-teletraining capabilities and for a multi-media authoring and delivery system that will provide single-instructor training to multiple sites, and allow subject matter experts to develop and modify curriculum materials that involve video, computer-generated lessonware and interactive electronic technical data. Completed tasks in FY94 include: a) demonstration of advanced Interactive Courseware for Total Ship Survivability that will embed within the Integrated Shipboard Management System that is under development, in order to improve decision-making under stress, and to integrate damage control, engineering and combat systems personnel into a more effective team, and b) evaluated the Navy Corrections Retraining Assessment Model's ability to raise the performance and retention potential of Navy personnel in corrective custody.

PROJECT OVERVIEW

		95	96
PROJECT: L1773	SIMULATION AND TRAINING DEVICES	$6.2M	$5.8M

PE: 0603707N MANPOWER, PERSONNEL AND TRAINING ADVANCED TECHNOLOGY

CONGRESSIONAL CATEGORY: TRAINING SYSTEMS

PROJECT SYNOPSIS:

FY95 plans: new start to demonstrate real-time beam forming and signal
processing simulation technology combined with innovative instructional
techniques in order to strengthen submarine sonar employment training and
increase utilization of the BQQ-5 Sonar System from about 30% to nearly
100% of its designed capabilities; FY95 continuations: a) demonstrate
NASNET Distributed Interactive Simulation (DIS) technology on fielded F-14B
and F-14D trainers as part of an effort to provide high fidelity training
systems networks for affordable training that will exercise all aviation
components in a realistic environment including joint operations, b)
continue deployable instructor support program by beginning development of
a guidance system to assist in diagnosing performance, selecting scenarios
and implementing training strategies. This program is essential if the
fleet is to realize the vast potential of embedded and onboard tactical
team training systems, which currently lack support or training for
instructors; FY95 completions: implement C4I-related DIS protocols and
demonstrate the ability of ACSTT's Combat Direction Center to respond to a
wide variety of automated and semi-automated forces; test DIS network
connectivity in joint training and mission rehearsal scenarios in order to
improve the Navy's ability to operate in a wide variety of force
configurations, including some that may not be defined until units are on
the scene.

FY96 plans: new start to initiate the integration and development of
Virtual Environment Training Technology (VETT) for seated tasks such as
those performed by Naval Aviators in order to improve the fidelity and
significantly reduce the costs and physical size of aviation training
devices. FY96 continuations: a) demonstrate vastly improved shipboard
instructor support based on new technology onboard a ship in support of
afloat training and BFTT in order to improve tactical team training, and b)
continue to improve innovative instructional and simulation techniques for
sonar employment training using Commercial-Off-The-Shelf (COTS) hardware in
order to greatly improve training and to reduce training systems costs by a
factor of ten. FY96 completions: a) implementation of NASNET DIS technology
in additional fielded training systems such as the E-2C trainers, and b)
demonstrate the networking of Naval aviation trainers to Navy ships via
BFTT and other services' training devices to improve joint training and
mission rehearsal.

PAYOFF/UTILIZATION:

FY94 specific accomplishments: a) initiated development of technology for

automated, on-line assessment of individual and team performance as the first stage of an effort to develop shipboard instructor support that can greatly improve training for complex decision-making in the high-stress, ambiguous environments of limited objective, littoral warfare. FY94 continuations: a) demonstrated ability to interface a generic flight simulation to a large scale network of dissimiliar simulation systems representative of joint operations, and b) expanded the capabilities of Naval Aviation Simulation Network Training (NASNET) Interface Units in support of developing products that will meet the requirements of joint service distributed training. FY94 completions: a) completed development and evaluation of Forward-Deployable Aviation Simulator Technology, including evaluation of helmet mounted displays, b) integration of moderate cost photo image generation system, and c) man-in-the-loop experiments to determine required cockpit/visual system fidelity requirements; d) designed, tested and evaluated shipboard EW sensors (AN/SLQ-32) for Battle Force Tactical Trainer (BFTT) milestone DT-IIA and provided BFTT connectivity and appropriate simulation technology for the Surface Warfare Officers School as part of the Organic Combat Systems Training Technology (OCSTT) task.

PROGRAM ELEMENT OVERVIEW

PE: 0603792N   ADVANCED TECHNOLOGY DEMONSTRATION

FUNDING: FY95 $ 3.8M (FY96 PRESIDENT'S BUDGET)
                                 FY96 $ 8.0M (FY96 PRESIDENT'S BUDGET)

PE SYNOPSIS:

This Program Element (PE) demonstrates high-risk/high-payoff technologies
that could significantly improve Joint Chiefs of Staff's Future Joint
Warfighting Capabilities.

Advanced Technology Demonstration (ATD) programs cover integrating and
assessing technology in a realistic operational environment. These programs
offer an opportunity to identify and efficiently move emerging technologies
from laboratory experiments to fleet systems.

ATD programs are selected for a match between technological potential and
Navy requirements which are derived from operational issues of concern to
the fleet and the Joint Mission Area/Support Area assessments, and the
Science and Technology Roundtables.

Risk-reducing ATDs are focused on laying the technical foundations for
acquiring improvements to future joint-warfighting capabilities.

Each demonstration is designed to assess for acquisition managers to the
extent to which the technology is feasible, affordable and compatible with
operational concepts and projected force structure.

This Program is budgeted within the Advanced Development Budget Activity
because it encompassess design, development, simulation, or experimental
testing or prototype hardware to validate technological feasability and
concept of operations and reduce technological risk prior to initiation of
a new acquisition program or transition to an ongoing acquisition program.

RELATED ACTIVITIES:

Industry Independent Research and Development (IR&D) programs are sources
of technology opportunities for ATDs. All sub-projects are either
Navy-unique in character or fully coordinated with other Services. For each
ATD, a transition plan is in place to facilitate transition from the
ATD-stage to the next level.

Related Navy PEs are: a) PE 0601153N (Defense Research Sciences); b) PE
0602111N (Surface/Aerospace Surveillance & Weapons); c) PE 0602121N
(Surface Ship Technology); d) PE 0602122N (Aircraft Technology); e) PE
0602232N (Command, Control, and Communication Technology); f) PE 0602233N
(Readiness, Training and Environmental Quality Tech); g) PE 0602234N
(Materials, Electronics, and Computer Technology); h) PE 0602270N
(Electronic Warfare Technology); i) PE 0602314N (Undersea Surveillance and
Weapons Technology); j) PE 0602323N (Submarine Technology); and k) PE

0602435N (Oceanographic and Atmospheric Technology).

PAYOFF/UTILIZATION:

Provide transition of the Navy's most promising technological
opportunities.

PROJECT OVERVIEW

95	96

PROJECT: R1889   HELMET-MOUNTED MISSION $3.8M $8.0M
                                    REHEARSAL SIMULATION
                                    SYSTEM (HHMRSS)

PE: 0603792N   ADVANCED TECHNOLOGY TRANSITION

CONGRESSIONAL CATEGORY: TRAINING SYSTEMS

PROJECT SYNOPSIS:

This program demonstrates high-risk/high-payoff technologies that could
significantly improve Joint Chiefs of Staff's Future Joint Warfighting
Capabilities.

Advanced Technology Demonstration (ATD) programs cover integrating and
assessing technnology in a realistic operational environment. These
programs offer an opportunity to identify and efficiently move emerging
technologies from laboratory experiments to fleet systems.

ATD programs are selected for a match between technological potential and
Navy requirements which are derived from operational issues of concern to
the fleet and the Joint Mission Area/Support Area assessments.

Risk-reducing ATDs are focused on laying the technical foundations for
acquiring improvements to future joint-warfighting capabilities.

Each demonstration is designed to assess for acquisition managers, to the
extent to which the technology is feasible, affordable and compatible with
operational concepts and projected force structure.

FY95 plans are to complete integration of helmet-mounted display with
enhanced photo imagery display capability, including rapid updates of
target/threat imagery.

FY96 plans for HMMRSS are to complete the final demonstration of
next-generation mission rehearsal system, and for the Advanced Embedded
Training Concepts for Shipboard Systems: a) initiate ATD to improve
shipbord training, and b) complete integration of enabling technologies
including: eye tracking, advanced computer technology, helmet-mounted
displays, and advanced visualization techniques.

PAYOFF/UTILIZATION:

FY94 specific accomplishments included continued development of prototype
system for improving pilot mission performance through on-ship
virtual-reality training.

PROGRAM ELEMENT OVERVIEW

PE: 0604703N PERSONNEL, TRAINING, SIMULATION, AND HUMAN FACTORS

FUNDING: FY95 $ 1.1M (FY96 PRESIDENT'S BUDGET)
                                FY96 $ 1.0M (FY96 PRESIDENT'S BUDGET)

PE SYNOPSIS:

This Program applies advanced technologies to operational requirements in
Manpower, Personnel, Training, and Human Factors, and transitions into
operation those Projects demonstrated in advanced development. Enabling
technologies include adaptive testing, math optimization, statistical and
econometric forecasting, computer-based simulation, and Decision Support
Systems (DSS).

The in-house organization performing this work is the Navy Personnel
Research and Development Center and Naval Command, Control and Ocean
Surveillance Center, RDT&E Division, San Diego, CA.

RELATED ACTIVITIES:

0602722A, Personnel and Training; 0602703F, Personnel Utilization
Technology; 0603731A, Manpower and Personnel; 0603707N, Manpower,
Personnel and Training Advanced Technology Development; and 0603704F,
Manpower and Personnel Systems Technology.

PAYOFF/UTILIZATION:

The payoff of this Program Element is improved personnel readiness through
improved alignment of personnel inventory with authorizations.

PROJECT OVERVIEW

	95	96

PROJECT: L1822   MANPOWER, PERSONNEL, AND $1.1M $1.0M
                            HUMAN FACTORS SYSTEM

PE: 0604703N PERSONNEL, TRAINING, SIMULATION, AND HUMAN FACTORS

CONGRESSIONAL CATEGORY: MANPOWER and PERSONNEL

PROJECT SYNOPSIS:

The objective of this Project is to apply advanced technologies to operational requirements in Manpower, Personnel, Training, and Human Factors, transitioning into operation those Projects demonstrated in advanced development.

Enabling technologies include adaptive testing, math optimization, statistical and econometric forecasting, computer-based simulation, and Decision Support Systems (DSS).

FY95 plans: a) transition prototype version of unrestricted line officer career management model to other officer communities, and integrate with officer strength planning and promotion planning systems; b) extend "C" School Planning System to "A" Schools and expand both to estimate effects of training on fleet readiness; c) begin evaluation and expansion of the Brig Retraining System; and d) transition to officer communities the Target System for defining loss incentive populations.

FY96 plans: a) implement the "C" and "A" School Planning Systems to permit feasibility analyses based on school capacities and to estimate cost of PCS moves on training plans; b) test and refine the QOL socioeconomic model to predict increases/decreases in retention and readiness in response to varying levels of QOL support; c) transition the Future Generation Decision Support System for detailers to operation by completing an intelligent interface for accessing multiple assignment information systems; d) begin conversion of demonstration manpower allocation model to an all-Navy model; e) complete implementation of the Enlisted Community Managers' integrated modeling system, developed in advanced technology demonstration; f) develop common strength plan costing system for Pers-2 and Pers-7 to ensure personnel policies implemented are consistent with dollars available.

PAYOFF/UTILIZATION:

FY94 specific accomplishments: a) completed MORA prototype validation on USS Coronado; b) completed transition of Officer Community Management System to LAN operation; c) expanded the Navy "C" School Planning System to permit feasibility analyses based on school capacities and to estimate permanent change of station costs of training plans; d) began development of the Enlisted Loss Incentive Planning System; e) refined the Job Performance Equations for the Personnel Quality Requirements System, to permit cost/performance tradeoff analyses.

AIR FORCE Program Element and Project Synopses

PROGRAM ELEMENT OVERVIEW

PE: 0601102F   DEFENSE RESEARCH SCIENCES

FUNDING: FY95 $ 9.2M   (FY96 PRESIDENT'S BUDGET)
                                FY96 $ 9.7M   (FY96 PRESIDENT'S BUDGET)

PE SYNOPSIS:

This Technology Base Program, managed by the Air Force Office of Scientific
Research (AFOSR), supports Air Force research efforts comprised of in-house
investigations in Air Force laboratories and extramural activities in
academia and industry. The Program Element funds broad-based scientific and
engineering basic research in technologies critical to the Air Force
mission. These technologies include: a) aerospace structure, b)
aerodynamics, c) materials, d) propulsions, e) power, f) electronics, g)
computer sciences, h) directed energy, i) conventional weapons, j) life
sciences, k) terrestrial, l) atmospheric, and m) space sciences. All
projects are coordinated through the Project Reliance process to harmonize
efforts, eliminate duplication, and ensure the most effective use of funds.
All technology areas are subject to long-range research planning and
technical review by Tri-Service Scientific Planning Groups that interface
with and support the twelve Technology Panels of the Joint Directors of
Laboratories (JDL).

This program is managed by the Air Force Office of Scientific Research,
Washington, DC, with in-house research done by Armstrong Laboratory, Brooks
AFB, TX.

RELATED ACTIVITIES:

Related activities for this Program Element include PE 0602202F, Human
Systems Technology, and PE 0602702F, Command, Control and Communication.

PAYOFF/UTILIZATION:

The payoff of the MPTS portion of this Program Element is to support basic
research on the human capability to process information quickly and
accurately. Such research supports Air Force technology needs for personnel
selection, classification, and training, and for the design of modern
systems for human-machine interfaces or artificial intelligence and signal
processing.

PROJECT OVERVIEW

		95	96
PROJECT: 2313	HUMAN PERFORMANCE	$9.2M	$9.7M

PE: 0601102F

CONGRESSIONAL CATEGORY: HUMAN FACTORS

PROJECT SYNOPSIS:

This Project provides fundamental knowledge of information processing in humans and other complex organisms needed to advance technologies of autonomous systems, command and control, human systems integration, and personnel selection and training. Research on sensory and perceptual processing impacts technologies of computer image and speech processing, human interface, and personnel selection. Research on cognitive and team processes impacts technologies of selection, education and training, command and control, and adaptive autonomous systems. Supported areas of research include: Vision, Hearing, Cognition, Spatial Orientation, Intelligent Tutor, and Situational Team Awareness.

FY95 plans: a) investigate team member fatigue and stress to determine optimum performance environments for command, control, and communications; b) model human performance using computer algorithms for application to virtual environments/workstations design; c) conduct cognition research to address complex decision-making; d) research spatial disorientation in the Spatial Disorientation Device at the Armstrong Laboratory; e) determine the sensory threshold changes associated with off variable axis rotation-induced spatial disorientation; and f) continue research in Vision, Hearing, Cognition, Spatial Orientation, Intelligent Tutors, and Team Situational Awareness.

FY96 plans: a) continue research in Vision, Hearing, Cognition, Spatial Orientation, Intelligent Tutors, and Team Situational Awareness; b) determine optimal compression for human viewing; c) determine mechanisms of human auditory localization; d) evaluate models of advising inthe context of intelligent tutoring; and e) determine the performance dimensions of human psychomotor abilities.

PAYOFF/UTILIZATION:

FY94 specific accomplishments: a) created model of human auditory processing and expressed it in a single computer chip now under evaluation as front-end for speech recognition; b) created model of space variant image processing based on human image processing, potentially used for low bandwidth high fidelity image generation; and c) generated model of human cognitive abilities under evaluation for selection and classification.

PROGRAM ELEMENT OVERVIEW

PE: 0602202F   HUMAN SYSTEMS TECHNOLOGY

FUNDING: FY95 $ 33.6M (FY96 PRESIDENT'S BUDGET)
                                        FY96 $ 64.9M (FY96 PRESIDENT'S BUDGET)

PE SYNOPSIS:

This exploratory development program establishes technology feasibility and develops the technology base for Air Force human interface needs required for weapon systems, operational readiness, and environmental quality.

Six key thrust areas are: a) crew systems, b) human resources, c) aerospace medicine, d) occupational and environmental health, e) environmental compliance, and f) site remediation.

Funding indicated includes only the Manpower, Personnel, Training, and and Safety (MPTS) portion of this Program Element.

RELATED ACTIVITIES:

Related activities for this Program Element include: 0602233N, Mission Support Technology: Personnel, Training, and Simulation, Technology area; 0602716A, Human Factors Engineering Technology Development; 0602727A, Non-System Training Devices Technology; 0602785A, Manpower, Personnel, and Training Technology; 0603106F, Logistics Systems Technology; 0603227F, Personnel, Training, and Simulation Technology; 0604227F, Flight Simulator Development; 0604243F, Manpower, Personnel, and Training Development; 0602201F, Aerospace Flight Dynamics; 0602204F, Aerospace Avionics; 0602702F Command, Control, and Communications; 0603205F, Aerospace Vehicle Technology; 0603227F, Advanced Simulator Technology; 0603231F, Crew Systems and Personnel Protection Technology; 0603245F Advanced Fighter Technology Integration.

This Project has been coordinated through the Project Reliance process to harmonize efforts and eliminate duplication.

PAYOFF/UTILIZATION:

The payoffs for this research will improve combat effectiveness by expanding the parameters defining operationally safe performance limits. The payoffs for the MPTS portion of this Program Element include: a) protection of U.S. Air Force resources through the development of designs for visual camouflage, optical countermeasures, and techniques to defeat infrared and radar sensors; and b) the development of methods to simulate man's interface with machines, and measure the changes in weapon effectiveness as a result of changes in man-machine coupling.

PROJECT OVERVIEW

	95	96
PROJECT: 1121 TRAINING DEVELOPMENT AND ASSESSMENT TECHNOLOGY	$3.2M	$0.0M

PE: 0602202F   HUMAN SYSTEM TECHNOLOGY

CONGRESSIONAL CATEGORY: TRAINING SYSTEMS

PROJECT SYNOPSIS:

The objectives of this Project are to: a) develop technology to accelerate learning, increase skill/knowledge retention, and improve job performance; and b) develop cost-effective methods for designing, delivering, and evaluating training.

These objectives are based on the increased utilization of advanced technology, and changes in the overall qualifications of the recruit pool, which pose new challenges to the already demanding task of training Air Force recruits.

This Project is managed by the Armstrong Laboratory (AL), Brooks Air Force Base, TX. Work is performed by AL and by various contractors.

FY95 plans: a) continue to develop intelligent/adaptive training technologies, and 1) demonstrate the effectiveness of instructional strategiess for automated, intelligent instruction in operational tasks and settings, 2) complete evaluation of reading/writing tutor for fundamental literacy skills and assess scientific skills tutor, and 3) conduct field evaluation of virtual environment application to training technology; b) continue to develop intelligent, instructional design technologies, and 1) develop guidelines for developing adaptive, interactive courseware for Air Force education needs, 2) demonsrate interactive courseware for selected logistics environments, and 3) continue to develop interactive, multi-media distance learning technologies to increase the quality of distance training; and c) continue to develop intelligent training assessment technologies, and 1) deliver technology to support career field management planning, and 2) develop test components of a comprehensive framework for education and training assessment.

In FY96 this Project will be incorporated into Project 1123, Manpower, Personnel, and Training Technology.

PAYOFF/UTILIZATION:

FY94 specific accompliments: a) developed intelligent/adaptive training technologies, and 1) delivered technologies for building virtual environment-based intelligent tutors, 2) completed and commercialized word problem solving tutor to support teaching of critical math literacy skills in public education, and 3) evaluated use of intelligent tutor for teaching critical reading/writing literacy skills; b) developed intelligent, instructional design technologies, and 1) completed beta test on an

on-line, case-based instructional design support technology for novice instructional designers, 2) completed preliminary evaluation of an experimental, instructional design advisor technology to reduce the cost and time to design and develop interactive courseware, and 3) initiated development of interactive, multi-media distance learning technologies to increase the quality of distance training; and c) developed intelligent training assessment technologies, and 1) identified methods for validating training time allocation curves to maintain proficiency levels, and 2) developed and evaluated criteria and metrics to assess the effectiveness and efficiency of training technologies.

PROJECT OVERVIEW

                                                                    95   96

PROJECT: 1123   MANPOWER, PERSONNEL, AND $11.4M $23.1M
                                   TRAINING TECHNOLOGY

PE: 0602202F   HUMAN SYSTEM TECHNOLOGY

CONGRESSIONAL CATEGORY: TRAINING SYSTEMS

PROJECT SYNOPSIS:

This Project develops and evaluates new methods and techniques for aircrew
training. It investigates the spectrum of aircrew training for the best
ways to design, deliver, and assess training on the ground and in the air.
It develops and evaluates flight training technologies from desk-top
trainers to full mission simulators to determine how to achieve maximum
fidelity at minimum cost. This Project will reduce the cost of future
aircrew training technologies and increase the capability for realistic
combat training.

In FY96 and beyond, the following Mission Description will reflect work
previously reported under Projects 1121 and 7719. This Exploratory
Development program develops technologies to increase operational readiness
by providing more effective methods to classify, assign, train, and retain
personnel. This program focuses on reducing the manpower required to
operate and support weapon systems, and on improving the effectiveness of
the operators and maintainers.

FY95 plans: a) continue to develop concepts, trainers/simulators, and
associated technologies for improved Air Force aircrew training; 1) develop
guidelines for situational awareness in fighter operations, and 2) develop
Tri-Service training guidelines; b) develop guidelines for fidelitty
specifications for visual technologies to increase effectiveness of aircrew
training simulators; 1) develop and demonstrate color matching for
independent visual displays used in distributed combat training exorcise,
and 2) design user friendly eye position monitor for use in aircrew
training.

FY96 plans: a) develop intelligent/adaptive training technologies for
improved automated training; 1) demonstrate the effectiveness of
instructional strategies for automated, intelligent instruction in
operational tasks and settings; and 2) compare large-scale evaluation of an
intelligent tutor for fundamental science literacy skills, and of a
licensed reading/writing tutor for commercial sale; b) develop intelligent,
instructional design technologies to reduce cost and time of automated
training system design; 1) develop and evaluate desktop training technology
for logistics command and control; 2) complete formative evaluation of an
experimental instructional design advisor for providing intelligent
performance support to novice instructional designers; and 3) develop
interactive, multi-media distance learning technologies to increase the
quality of distance training; c) develop intelligent training assessment
technologies to improve evaluation of training effectiveness; 1) complete

development and evaluation of an experimental, intelligent training decision support technology for assessing the impacts of change in personnel, budgets, and training resources; and 2) develop preliminary education and training assessment guidelines; d) continue to develop concepts, trainers/simulators, and associated technologies to improve Air Force aircrew training; 1) develop electronic classroom technology for aircrew training; 2) continue development of training guidelines for situational awareness training; and 3) continue development of part-task trainers for combat mission training; and e) develop guidelines for fidelity specifications for visual technologies used to improve training simulators; 1) determine terrain and target correlation specifications for dissimilar visual technologies used in distributed combat training exercises; 2) develop and evaluate eye position monitor for use in training aircrews; and 3) determine training value of alternative low cost visual displays for unit-level simulators.

PAYOFF/UTILIZATION:

FY94 accomplishments (accomplished in PE 0602205F): a) developed concepts, trainers/simulators and associated technologies for improved Air Force training; and b) developed and evaluated criteria and metrics for combat situational awareness for use in selecting and training F-15 pilots; c) developed single and multi-ship mission preparation models to improve aircrew mission preparation and rehearsal; d) developed guidelines for fidelity specifications for visual technologies used to improve aircrew training simulators; e) determined temporal specifications for image generators; and f) determined terrain and object density specifications for low-altitude flight.

PROJECT OVERVIEW

	95	96

PROJECT: 1710   LOGISTICS TECHNOLOGY $4.1M $6.6M

PE: 0602202F   HUMAN SYSTEM TECHNOLOGY

CONGRESSIONAL CATEGORY: HUMAN FACTORS

PROJECT SYNOPSIS:

This Project develops new technologies to: a) improve logistics support for both combat and peacetime operations; b) enhance logistics planning and assessment models for realistic wartime and contingency operations; c) improve logistics support requirements' trade-off and design methods to reduce manpower and equipment needed to support logistics operations in dispersed locations; and d) develop software tools for use in designing improved reliability, maintainability, supportability, and man-machine interfaces to reduce life-cycle costs and increase system affordability.

This Project is managed by the Armstrong Laboratory (AL), Wright-Patterson Air Force Base, OH. This work is performed by AL and by selected contractors.

This Project was formed from the same Project in Program Element 0602205F and an associated portion of Project 06HT.

FY95 plans: a) develop requirement assessment tools to improve wing-level contingency logistics planning and support equipment operational concepts; b) develop and assess requirement tracking and design trade-off tools; and c) develop needs assessment methods and technologies to improve wing-level logistics planning and support.

FY96 plans: a) develop technology for improved logistics planning, for support equipment upgrades, and for more effective software maintenance; b) continue to develop needs assessment methods and technology to improve wing-level contingency logistical planning and support; and c) continue to develop improved software maintenance technology on-board aircraft systems.

PAYOFF/UTILIZATION:

FY94 specific accomplishments: a) development of technology to improve requirements definitions and design of reliable, maintainable, and supportable Air Force weapon systems; b) development of technology to determine how well humans interact with and operate new equipment; c) development of functional specifications for an advanced definition of system requirements and decision support tool; and d) development of technology to improve analysis of logistics support reliability, maintenance, and supportability.

PROJECT OVERVIEW

	95	96

PROJECT: 6893   MANNED WEAPON SYSTEMS $0.6M $0.0M
                        EFFECTIVENESS

PE: 0602202F HUMAN SYSTEM TECHNOLOGY

CONGRESSIONAL CATEGORY: HUMAN FACTORS

PROJECT SYNOPSIS:

This Project develops technology related to human vision and motion per-
ception in manned weapon systems. The goal is to determine weaknesses and
strengths in these two critical human characteristics to assess
effectiveness for: a) safety of flight; b) visual countermeasures; and c)
air-to-ground, air-to-air, and space-based operations.

This Project was formed from the same project in Program Element 0602202F
and an associated portion of Project 06MD.

FY95 plans: a) complete development of camouflage, concealment, deception,
and obscuration techniques to disrupt target acquisition and intelligence
gathering; b) complete development and test of human vision performance
model in decision aid used to predict target infrared signatures; c)
explore human information processing and biocybernetic system control
technologies for aircrew technologies; d) develop direct vestibular
stimulation techniques to improve training fidelity and eliminate motion
platforms; e) continue examining crew visual performance in micro-G and
high-speed environments; and f) collect visual accommodation data during
sustained Air Force operations on-orbit using visual function tester.

This Project will be completed at the end of FY95.

PAYOFF/UTILIZATION:

The payoffs of this Project are protection of U.S. Air Force resources
through the development of designs for visual camouflage, optical
countermeasures, and techniques to defeat infrared and radar sensors.
Countermeasure designs and techniques are developed and delivered to
Tactical Air Command.

FY94 specific accomplishments: a) developed technology for camouflage,
concealment, deception, and obscuration techniques to disrupt target
acquisition and intelligence gathering; b) tested improved, blended
camouflage net for hiding parked aircraft from air attack; c) explored
human information processing and biocybernetic system control technologies
for aircrew technologies; d) published guide for determining effects of time
delays on man-in-the-loop simulation fidelity; e) developed technology for
assessing and enhancing crew visual performance in micro-G and high-speed
environments; and f) evaluated visual function tester while performing Air
Force missions on-orbit.

PROJECT OVERVIEW

	95	96

PROJECT: 7184   CREW TECHNOLOGY $5.7M $27.4M

PE: 0602202F HUMAN SYSTEM TECHNOLOGY

CONGRESSIONAL CATEGORY: HUMAN FACTORS

PROJECT SYNOPSIS:

This Project develops procedures and technologies to optimize the interface between Air Force personnel and the weapon systems. Use information about the characteristics of human operators to provide design data for system control and display development. The goal is to develop, validate, and transition data, methods, and technology to improve the human interface with Air Force systems. Beginning FY96 and beyond, the following Mission Description will reflect work previously reported under Projects 6893, 7930, and a portion of 7231. This Project develops technology required to improve human performance, protection and survivability in operational environments. This is accomplished by defining the physical parameters, capabilities and limits of systems operators; by determining human responses to operational stressors such as noise, impact, vibration, hostile fire, sustained acceleration, spatial disorientation, altitude, workload, and sustained operations; and by optimizing the human-machine interface. The Project produces human factors design criteria, guidelines, and automated design tools for the development of effective technologies for information display, control interfaces, emergency escape, acceleration protection, and aircrew life support. In response to immediate human factors problems in Air Force weapon systems, the Project provides rapid solutions to systems program offices and operational warfighters.

FY95 plans: a) develop unobtrusive, reliable predictors of human-system effectiveness; b) complete analysis of the role of attention allocation in situation awareness; c) develop a portable version of a monitor for measuring physiological variables to assess mental workload; d) develop system design technologies for greater integration of human performance data and crew system interfaces; e) complete development of multi-media visualization technology for human performance data to optimize crew systems design; f) demonstrate capability to perform digital laser whole body scans for accurate definition of equipped aircrew members; g) explore and develop technology for visual displays and symbology for improvement of human-machine interfaces; h) develop technology for advanced hybrid optical elements to provide a see-through HMD with resolution, luminance, and contrast performance approaching that of current full-size displays; and i) verify standards for cockpit Head-Down Display symbology.

FY96 plans: a) complete preliminary exploration of human information processing and biocybernetic control technologies for aircrew systems, and publish book on perception and control of self-motion in low-altitude flight; b) continue development of unobtrusive, reliable predictors of human system effectiveness, to include a neural network-based system of performance measurement for flight test, and 1) develop demonstrator

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technology for in-flight multi-channel recording electroencephalograph (EEG) signals, 2) complete demonstration of a neural-based Workload Redline concept which combines physiological, performance, and system measurement to predict mental work overload, and 3) complete concept evaluation of airborne physiological monitor for night, low-level, high-speed flight environments; c) continue development of system design technologies for integration of human performance data and crew system interfaces including a task time estimator; d) continue development of visual displays and symbology for improvement of human-machine interfaces; e) continue to develop injury threshold determination criteria and related technologies for improved protection equipment for aircrew and support personnel; f) continue to develop technologies to measure and predict human auditory responses and to provide criteria for voice communication for particular Air Force weapon systems and base operations; g) continue to develop technologies for evaluating and improving aircrew protection and effectiveness in operational environments; and h) continue to develop technologies for sustained aircrew operations and integration of life support systems into aircraft to improve aircrew performance.

PAYOFF/UTILIZATION:

FY94 specific accomplishments: a) developed technology for human performance and workload assessment to permit enhanced matching of pilot capabilities and cockpit tasks required during combat; b) evaluated the most commonly used measures of situation awareness for potential application to pilot situation awareness; c) completed workload evaluation of Quiet Knight II Special Operations Penetration Mission Avionics System routes based on stored and real time information; d) developed system design integration technologies to improve the ability of engineers to properly consider human factors early in the design process; e) applied human engineering principles to cockpit design and mission support; f) demonstrated human body model with virtual scene and controls scaled to match variable body sizes to improve computer-aided design tools; g) explored and improved human-machine interfaces for enhancing aircrew performance using exploratory technology for better equipment fit and more effective control of subsystems from the cockpit; h) developed Helmet-Mounted Displays (HMDs) and controls to improve air-to-air situation awareness; i) evaluated low-profile night vision goggle for specialized ground and flight crew operations; and j) completed a synthetic environment simulator technology for joint U.S./French development and evaluation of advanced interface concepts.

PROJECT OVERVIEW

95	96

PROJECT: 7231   SAFETY AND AIRCREW $2.5M $0.0M
EFFECTIVENESS IN
MECHANICAL FORCE
ENVIRONMENTS

PE: 0602202F   HUMAN SYSTEM TECHNOLOGY

CONGRESSIONAL CATEGORY: HUMAN FACTORS

PROJECT SYNOPSIS:

This Project determines human response to mechanical forces including:
noise, impact, vibration, and hostile fire. This information is used for
safe, effective escape/ejection systems, acceleration protection equipment,
aircrew restraint devices, and for reducing crew station vulnerability.
This Project also develops technology based on understanding of the human
auditory system for activities such as operator-centered communications,
jamming, and noise exposure criteria. The Project also develops
telepresence technology for remote operation of mechanical systems by Air
Force personnel.

This Project is managed by the Armstrong Laboratory (AL), Brooks AFB, TX.
Work is performed by AL and various contractors.

This Project was formed from the same Project in Program Element 0602202F
and an associated portion of Project 06MD, and will be completed at the end
of FY95.

FY95 plans: a) develop technologies for improved aircrew and support
personnel protection equipment, and b) develop technologies to measure and
predict the effects of human auditory responses to particular Air Force
weapon system and base operations.

This Project will be completed at the end of FY95.

PAYOFF/UTILIZATION:

FY94 accomplishments: a) developed technologies for improved aircrew and
support personnel protection equipment, and b) developed technologies to
measure and predict the effects of human auditory responses to particular
Air Force weapon system and base operations.

PROJECT OVERVIEW

95   96

PROJECT: 7719   FORCE ACQUISITION AND $2.7M $0.0M
                            DISTRIBUTION TECHNOLOGY

PE: 0602202F HUMAN SYSTEM TECHNOLOGY

CONGRESSIONAL CATEGORY: MANPOWER and PERSONNEL

PROJECT SYNOPSIS:

This Project develops personnel qualification and aptitude measurement
methods, job specification standards, and manpower and personnel models to
provide methods and tools for optimal selection, classification, and
assignment of personnel.

This Project is managed by Armstrong Laboratory (AL), Brooks Air Force
Base, Texas. The work is performed by AL and by various contractor.

This Project was formed from the same Project in Program Element 0602205F
and an associated portion of Project 06HT.

FY95 plans: a) continue to develop technologies to help identify, classify,
and retain various categories of Air Force personnel; b) develop
benchmarked occupational learning difficulty ratings to help determine the
most efficient entry-level and career job assignment aptitude criteria; c)
develop a job structuring computer-based decision aid to assist career
field managers in designing the most efficient force to achieve mission
accomplishment; d) develop a modeling approach to determine key manpower,
personnel, and training interfaces to ensure that new weapon systems and
major modifications are procured at the lowest possible life-cycle costs;
e) continue to develop technologies to assess individual qualities/
abilities (e.g., cognitive, physical, spatial, etc.) of Air Force
personnel; f) collect technical school performance data to verify
experimental abilities measurement test battery; g) develop noncognitive
measures to explore potential for incremental validity over cognitive
measures; h) continue development of performance assessment methodologies
to determine mission readiness of personnel; i) identify theoretical
foundation for conducting research into gender effects on performance; j)
develop crew resources management test technology for selecting Air
National Guard and United States Air Force Reserve pilots; k) interview
experienced C-130 pilots and collect crew resource management performance
events and alternative behavioral responses; and l) interview experienced
and novice C-130 pilots to evaluate crew resource management performance
alternatives for development of test scoring keys.

This Project will be completed at the end of FY95.

PAYOFF/UTILIZATION:

FY94 specific accomplishments: a) developed technologies to help identify,
classify and retain various categories of Air Force personnel; b) developed

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technologies to assess enlisted recruits costs by aptitude and job interest to ensure the most effective use of limiting recruiting resources; c) developed an automated job survey technology that will assist commanders in assessing what people do in the Air Force jobs, what training is required, and how jobs should be structured; d) developed a technology to determine the effects of improvements to Air Force selection and classification procedures on user-selectable measures of merit; e) developed an analysis of the Air Force occupational structuring process - essential to making future improvements to the job structuring system; f) developed technologies to assess individual qualities/abilities (e.g., cognitive, physical, spatial, etc.) of Air Force personnel; g) developed experimental computerized abilities measurement test battery technology to improve selection and classification; h) completed development of cognitive task analysis methodologies for identifying underlying mental abilities required for complex high-technology jobs; i) refined cognitive abilities measurement and began developing psychomotor abilities measurement methodologies for incorporation into experimental abilities test battery; j) developed and evaluated computer-assisted personality test methods for pilot selection; k) developed computer software for an objective approach to personality that minimizes subject faking and misrepresentation; and l) verified self-report format for personality measurement against tactical air combat performance.

PROJECT OVERVIEW

	95	96
PROJECT: 7755 HUMAN BIODYNAMICS AND PHYSIOLOGY	$1.1M	$7.8M

PE: 0602202F   HUMAN SYSTEM TECHNOLOGY

CONGRESSIONAL CATEGORY: HUMAN FACTORS

PROJECT SYNOPSIS:

The human operator is the enabling factor in all aerospace systems. The goal of this Project is to optimize aircrew effectiveness through development of the understanding of: 1) biodynamic conditions affecting aircrew selection and retention; 2) methods of early disease detection; 3) impact of asymptomatic disease on aircrew performance; 4) therapeutic drug effects on flight safety; and 5) physiological factors affecting operational readiness and effectiveness.

This Project is managed by the Armstrong Laboratory (AL), Brooks AFB, TX. Work is performed by AL and various contractors.

FY95 plans: a) conduct biodynamic investigations to develop aircrew standards, and 1) develop standards (i.e., cardiovascular, vision/optical devices, neuropsychiatric and hearing/vestibular standards) to improve aircrew selection, retention and performance, 2) develop aircrew performance-based standards in areas such as high-G acceleration, microgravity, and dehydration, and 3) develop better capability to assess defense women's health issues (i.e., obstetrics-gynecology [ob-gyn], orthopedic, hyperbaric oxygen therapy, G-tolerance) affecting female aircrew; and b) develop operational performance enhancement devices, and 1) develop therapeutic, prophylactic, and performanc enhancing medication in the aviation environment, and 2) develop alternative therapy to treat decompression sickness.

FY96 plans: a) conduct biodynamic investitgations to develop aircrrew standards, and 1) refine standards (i.e. cardiovascular vision/optical devices, neuropsychiatric, and hearing/vestibular standards) to improve aircrew retention and performance, 2) evaluate aircrew performance-based standards in areas such as high-G acceleration, microgravity, and dehydration, and 3) continue to develop better capability to assess defense women's health issues (i.e., obstetrics-gynecology [ob-gyn], orthopedic, hyperbaric oxygen therapy, G-tolerance) affecting female aircrew; and b) develop operational performance enhancement devices through test and evaluation of therapeutic, prophylactic, and performance enhancing medication in the aviation environment.

PAYOFF/UTILIZATION:

FY94 specific accomplishments: a) conducted biodynamic investigations to develop aircrew standards, and 1) completed studies on the effects of altered high-G acceleration environments on cardiovascular physiology, 2)

developed preliminary protocol for therapeutic drug use in aircrew, and 3) completed studies on ability to fly safely for aircrew with a history of ventricular tachycardia or gallstones; and b) developed operational performance enhancement devices, and 1) developed improved standards for vision protection devices against such hazards as ultra-violet light, laser radiation, and glare, and 2) designed joint Air Force/civilian program to develop a more cost-effective method to treat decompression sickness.

PROJECT OVERVIEW

	95	96

PROJECT: 7930   ADVANCED CREW TECHNOLOGY $2.2M $0.0M

PE: 0602202F HUMAN SYSTEM TECHNOLOGY

CONGRESSIONAL CATEGORY: HUMAN FACTORS

PROJECT SYNOPSIS:

This Project studies human response to physiological stressors such as
rapid onset sustained acceleration, spatial disorientation, altitude,
workload, and sustained operations. Design criteria and brass-board
protective systems and procedures are developed to improve crew performance
in these challenging environments. Additional tasks involve the evaluation,
cockpit integration, and man-rating of life support equipment.

This Project is managed by the Armstrong Laboratory (AL), Brooks AFB,
TX. Work is performed by AL and various contractors.

This Project was formed from the same Project in Program Element 0602202F
and an associated portion of Project 06MD.

FY95 plans: a) develop technologies for evaluating and improving aircrew
protection and effectiveness in operational environments; b) develop
technologies to improve aircrew protection and effectiveness in a high-G
acceleration environment; c) develop advanced life support equipment
technology to improve aircrew protection and effectiveness at high
altitude; d) develop technologies for sustained aircrew operations and
integration of life support technologies into aircraft to improve aircrew
safety and performance; e) develop technologies to enhance aircrew
sustained operational performance; f) develop spatial disorientation
awareness training methods; g) develop technologies to optimize cockpit
display symbology and spatial countermeasures; and h) develop technologies
for oxygen generation.

This Project will be completed at the end of FY95.

PAYOFF/UTILIZATION:

FY94 specific accomplishments: a) demonstrated acceleration tolerance
enhancement and decompression sickness avoidance technologies to improve
aircrew performance and effectiveness in operational combat environments;
b) completed advanced computer model for decompression sickness; c)
developed technologies for prevention of spatial disorientation and for
improved aircrew performance during sustained operations in long-duration
missions; and d) demonstrated effects of fatigue upon aircrew performance
during long-duration missions.

PROGRAM ELEMENT OVERVIEW

PE: 0603227F PERSONNEL, TRAINING, AND SIMULATION TECHNOLOGY

FUNDING: FY95 $ 8.9M (FY96 PRESIDENT'S BUDGET)
                                  FY96 $ 8.9M (FY96 PRESIDENT'S BUDGET)

PE SYNOPSIS:

This Advanced Development program develops and demonstrates improved
operational process and combat training through Manpower, Personnel, and
Training (MPT) technologies. MPT includes: a) systems to write
computer-based programs; b) decision-aiding systems to optimize personnel
use; c) job performance measurements technologies; d) analytical tools to
better consider MPT in systems design; and e) realistic aircrew combat
training. All efforts in this Program Element contain the resources
necessary, including civilian salaries to manage, conduct, and document
activities.

The in-house organization responsible for this Program Element is the
Armstrong Laboratory, Brooks AFB, TX and Mesa, AZ.

RELATED ACTIVITIES:

Related activities for this Program Element include: (a) 0602202F,
Human Systems Technology; (b) 0604227F, Flight Simulator
Development; and (c) 0604243F, Manpower, Personnel, and Training
Development.

Project 2743: The Navy has a liaison office at Armstrong Laboratory.

Projects within this Program Element have been coordinated through the
Project Reliance process to harmonize efforts and eliminate duplication.

PAYOFF/UTILIZATION:

The payoffs of this Program Element are improved operational readiness
through the development of Manpower, Personnel, and Training technologies.

PROJECT OVERVIEW

	95	96

PROJECT: 2743   COMBAT AIRCREW TRAINING $5.1M $5.2M
TECHNOLOGY

PE: 0603227F   PERSONNEL, TRAINING AND SIMULATION TECHNOLOGY

CONGRESSIONAL CATEGORY: TRAINING SYSTEMS

PROJECT SYNOPSIS:

This Project develops, demonstrates, and evaluates simulator-based air combat training as an affordable, effective, and realistic adjunct to flight-based training. Provides a testbed for examining aircrew skills, cognitive functions, behaviors, and instructional strategies that contribute to combat success. Evaluates technologies for long-distance computer networking to enhance current methods for joint-Service training.

FY95 plans: a) develop and demonstrate simulator and associated technology for armed forces personnel training; 1) develop low-cost, high fidelity, deployable demonstrator technology for the A-10; 2) demonstrate an F-15 four-ship network of simulators in an integrated threat environment; evaluate this technology for unit training; and 3) demonstrate deployable visual display technology for simulation in combat units; and b) develop and demonstrate Night Vision Goggle (NVG) training and guidelines to meet Air Force mission requirements; 1) develop and evaluate distance estimation training program for rotor wing NVG use; 2) develop and evaluate NVG training media and facility alternatives; and 3) develop high fidelity visual simulation imagery for NVG training.

FY96 plans: a) develop and demonstrate simulators and associated technologies for armed forces personnel training; 1) develop, integrate, and evaluate existing joint-Service training environments for Distributed Mission Training; 2) perform training utility evaluation of a multi-ship training air-to-ground technology testbed; and 3) develop advanced network gateway technology for distributed simulation; and b) continue to develop and demonstrate NVG training and guidelines to meet Air Force mission requirements; 1) continue development of high fidelity visual simulation of NVG imagery for NVG training; and 2) develop and demonstrate advanced NVG training course.

PAYOFF/UTILIZATION:

FY94 specific accomplishments: a) developed and demonstrated simulators and associated technologies for use in armed forces personnel training; 1) developed low-cost, full color, high-acuity screen technology for projection displays to be used in training; and 2) developed and evaluated a Tri-Service, wide area network of simulators for the development of joint-Service training guidelines; part of the Multi-Service Distributed Training Testbed; and b) developed and demonstrated technologies and/or evaluation methods for specific Air Force training arenas (i.e., control debriefs, night vision goggles, and situational awareness); 1) developed

control, debrief, and Air Combat Maneuvering Instrumentation-like viewing stations for manned multi-ship scenarios and mission rehearsals; and 2) transitioned introductory Night Vision Goggle (NVG) training course to Air Education and Training Command.

PROJECT OVERVIEW

		95	96
PROJECT: 2922	MANPOWER AND FORCE MANAGEMENT	$1.6M	$1.5M

PE: 0603227F PERSONNEL, TRAINING AND SIMULATION TECHNOLOGY

CONGRESSIONAL CATEGORY: MANPOWER and PERSONNEL

PROJECT SYNOPSIS:

This Project develops technologies to analyze Manpower, Personnel, and Training (MPT) factors early in weapon system design and acquisition to ensure the factors are supportable, and to enable trade-offs to accommodate MPT limitations and costs. Timely consideration of these factors will reduce weapon systems development and life-cycle costs.

FY95 plans: a) continue development of technologies and procedures to assist in linking the design and procurement of new weapon systems and major system modification to personnel capabilities and training factors to ensure that future acquisitions are acquired and maintained at lowest life cycle cost; 1) complete analysis of the MPT Decision Support System (DSS) for use in weapon system acquisition; 2) develop and demonstrate MPT decision support technology to aircraft design community; and 3) develop training technology for effective use of MPT decision support technology for weapon acquisition; b) develop situational awareness pilot selection test battery technology; 1) identify test battery content to include multi-tasking ability, spatial processing ability, and working memory; and 2) develop alternative technologies including software, scoring algorithms, and computer-based technologies.

FY96 plans: a) continue development of technology and procedures to assist in linking the design and procurement of new weapon systems and major system modifications to personnel capabilities and training factors to ensure that future acquisitions are acquired and maintained with lowest life cycle cost; 1) deliver the Manpower, Personnel, and Training (MPT) Decision Support System (DSS) technology to user community; 2) make available for transition the MPT DSS technology to 6.4 program and define necessary modifications and enhancements; 3) develop an integration procedure to link critical joint Service individual attributes to joint Service readiness; 4) define the requirements for a technology that determines wartime training requirements and optimally match personnel to wartime jobs; and 5) develop a joint-Service job classification technology for use during wartime missions; and b) develop technology for collection of field data for validation of situational awareness; 1) deploy applied technology analysis and hardware for the conduction at diverse locations including Undergraduate Pilot Training bases and ROTC detachments; and 2) conduct front-end analyses to determine if test battery software can be hosted in selected higher order language programs on Petlum-based test stations.

PAYOFF/UTILIZATION:

FY94 specific accomplishments: a) completed development of technologies and procedures to assist in linking the design and procurement of new weapons systems and major system modifications to personnel capabilities and training factors to ensure that future acquisitions are acquired and maintained at lowest life cycle cost; 1) developed and assessed initial version of a manpower estimation model for new weapon system design and maintenance manpower planning; and 2) developed and assessed initial version of a baseline comparison technology for estimating training and manpower requirements for weapon systems.

PROJECT OVERVIEW

	95	96

PROJECT: 2949   ADVANCED TRAINING $2.2M $2.2M
                              TECHNOLOGY

PE: 0603227F   PERSONNEL, TRAINING AND SIMULATION TECHNOLOGY

CONGRESSIONAL CATEGORY: TRAINING SYSTEMS

PROJECT SYNOPSIS:

This Project develops and demonstrates computer-based intelligent tutoring technology, for adaptive expertise across tasks in high-technology jobs; andsoftware enabling Air Force training developers to rapidly and affordably build intelligent computer-assisted training systems which continually interact with students for effective individualized training.

FY95 plans: a) develop and demonstrate advanced tutors and intelligent tutor authoring technologies for avionics and mechanical job families; 1) evaluate and deliver ACC troubleshooting tutor technology for hydraulics, radar and penetration aid shops, and flightline maintenance; b) continue to develop and demonstrate software and authoring tools for intelligent tutors; 1) continue field evaluation of RIDES authoring technology by building a tutor technology for B-2 aircraft maintenance technicians and for missile launch console operations; and 2) develop virtual environment-based ITS authoring technology; and c) continue to develop career field decision support software for personal computer use; 1) validate components of an integrated career field training management technology; and 2) evaluate user interface for the training impacts decision technology and develop specifications.

FY96 plans: a) continue to develop and demonstrate software and authoring tools for intelligent tutors; 1) deliver Rapid Intelligent Tutor System (ITS) Development System (RIDES) authoring to Air Force customers; and 2) continue to develop and evaluate Virtual Environment (VE)-based ITS authoring technology; b) continue to develop career field training decision support software for personnel computer use; 1) develop and deliver operator and analyst training programs for the training impacts decision technology; and 2) evaluate training impacts on decision technology in the field; and c) begin development of advanced instructional design advisor technology to reduce the cost and time to design and develop interactive courseware; 1) develop functional specifications for the Advanced Instructional Design Advisor (AIDA); and 2) develop architecture for AIDA.

PAYOFF/UTILIZATION:

FY94 specific accomplishments: a) developed tutor technology for avionics and mechanical job families; 1) evaluated and delivered to Air Combat Command (ACC) avionics intelligent tutor technology for aircraft maintenance troubleshooting skills; b) developed and demonstrated software and authoring tools for intelligent tutors; 1) developed pre-transition version of Rapid Intelligent Tutor System (ITS) Development System (RIDES)

technology; 2) developed tutors for UHF radio test procedures and for disassembling equipment using RIDES authoring technology; and 3) developed ITS authoring shell for building procedural training tutors; and c) developed career field training decision support software for personal computer use; 1) demonstrated effectiveness of career field education and training plan shell and transitioned it to Air Force career field managers; and 2) developed initial specifications for integrated training decision support technology.

PROGRAM ELEMENT OVERVIEW

PE: 0603231F CREW SYSTEMS AND PERSONNEL PROTECTION TECHNOLOGY

FUNDING: FY95 $ 8.5M (FY96 PRESIDENT'S BUDGET)
                                     FY96 $ 8.6M (FY96 PRESIDENT'S BUDGET)

PE SYNOPSIS:

The objective of this Advanced Development program is to develop and
demonstrate technologies to protect and enhance the performance of Air
Force personnel in operational environments.

Specific projects advance and integrate human factors technologies into
cockpit, life support, and aircrew equipment designs. All efforts in this
Program Element contain the resources necessary, including civilian
salaries, to manage, conduct, and document the technical activities.

The in-house organizations responsible for the Manpower, Personnel,
Training and Safety (MPTS) portion of this program are the Armstrong
Laboratory and the Wright Laboratory.

RELATED ACTIVITIES:

Related activities for the MPTS portion of this Program Element include:
(a) 0602202F, Human Systems Technology; (b) 0603238F, Global Surveillance
and Communications; and (c) 0604706F, Life Support Systems. These projects
has been coordinated through the Project Reliance process to harmonize
efforts and eliminate duplication.

PAYOFF/UTILIZATION:

The payoff of this Program Element includes advances in concepts,
components, and systems to protect Air Force personnel in operational
environments.

PROJECT OVERVIEW

	95	96

PROJECT: 2829   CREW-CENTERED COCKPIT $2.3M $2.0M
                       DESIGN

PE: 0603231F CREW SYSTEMS AND PERSONNEL PROTECTION TECHNOLOGY

CONGRESSIONAL CATEGORY: HUMAN FACTORS

PROJECT SYNOPSIS:

The objective of this Project is to develop, demonstrate, and transition
technology for design and modification of crew stations that will enhance
aircrew performance and safety. Using systems engineering, human factors
principles, mission requirements, and crew capabilities, the Project
develops rigorous, traceable, and human-centered ways to design and test
cockpits.

FY95 plans include developing and demonstrating human-centered software
tools for design and modification of crew stations by: a) demonstrating
advanced design process and tools applied on cockpits for enhanced
defensive situation awareness in conventional standoff attack mission; b)
planning beta test program and prepare crew-centered cockpit design
software tools and user manuals for release to industry/government cockpit
specialists for controlled user evaluations; c) completing version 3.0 of
crew-centered design process and implement on computer design system for
additional validation tests; and d) conclude operational test at flight
test agencies, document and transition to users.

FY96 plans: a) continue to develop and demonstrate human-centered software
tools for design and modification of crew stations by: 1) developing a
computer database and software tool for accommodating male and female
flying population during system design; 2) demonstrating advanced design
process and tools, showing the ability to accommodate full range of flying
population in cockpit design by accounting for ranges of male and female
size, strength and performance; and 3) performing a beta test program of
crew-centered cockpit design software tools at multiple user locations; and
b) continue to develop crew station design and evaluation technology to
support emerging distributed interactive system development process, by
demonstrating adaptation of the test planning, analysis and evaluation
system software and procedures, previously proven for cockpit flight
testing, for integrating the human system interface with advanced
distributed simulation environment.

PAYOFF/UTILIZATION:

FY94 specific accomplishments: (a) demonstration of crew-centered cockpit
design process and software tools for crew station modifications for
multi-place aircraft, including special operations applications by: 1)
completing second of five tests, demonstrating effectiveness of redesigned
AC-130H First Control Operator (FCO) cockpit in improving crew performance
and reducing crew workload for FCO, pilot and navigator stations; 2)

upgrading new design process and software suite of design tools based on first test of the AC-130H FCO cockpit; and 3) publishing and presenting four papers at a national electronics conference which described advanced cockpit design process, results of first test demonstrating effective application to single-place fighter upgrade, advanced design traceability manager software tool, and cockpit simulators; and b) conducted technology demonstration at USAF and USN flight test centers of computer support technology to enhance assessment process of new crew station designs, by demonstrating new test planning, analysis and evaluation computer tool for cockpit evaluation in field demonstrations by numerous test agency users at Air Force and Navy flight test centers.

PROJECT OVERVIEW

		95	96
PROJECT: 3257	HELMET-MOUNTED SENSORY TECHNOLOGIES	$6.2M	$6.6M

PE: 0603231F CREW SYSTEMS AND PERSONNEL PROTECTION TECHNOLOGY

CONGRESSIONAL CATEGORY: HUMAN FACTORS

PROJECT SYNOPSIS:

The objective of this Project is to develop and demonstrate advanced helmet-mounted sub-system technologies to improve mission effectiveness and pilot situational awareness during day or night operations and in all weather conditions. Through the development of advanced helmet-mounted tracker and display technologies (HMT/D), pilots will be able to detect, identify, target, and launch weapons faster and more accurately.

This Project also supports the improvement of night vision technology for aircrews to enhance capabilities at night. Changes in funding for this Project are due to increased emphasis on life support technologies.

FY95 plans: a) continue development and demonstration of helmet-vehicle interface and subsystem technologies for HMT/Ds through: 1) conducting test of new advanced HMT/D for fighter aircraft; 2) demonstrating standardized HVI for monocular HMT/Ds; 3) developing a new phosphor technology to improve CRT performance for HMT/D applications; and 4) evaluating target acquisition with HOBA missile seekers using improved HMT/D on two F-15C aircraft; and b) develop and demonstrate advanced night vision technologies for Air Force-specific aircrew requirements through: 1) evaluating improved image source technology for NVGs; and 2) studying anthropometric issues for fit of NVGs and HMT/Ds on full pilot population.

FY96 plans: a) continue development and demonstration of helmet-vehicle interface and subsystems technologies for helmet-mounted tracker and displays (HMT/D) through: 1) demonstrating advanced HMT/D for tactical air-to-air missions in a simulator; 2) developing a new image source for HMT/D that will provide color symbology capability; and 3) evaluating new subsystem technologies for HMT/Ds; and b) continue development and demonstration of advanced night vision technologies for Air Force-specific aircrew requirements through: 1) evaluating improved night vision goggles (NVG) technologies; and 2) studying anthropometric issues for fit of NVGs and HMT/Ds on full pilot population.

PAYOFF/UTILIZATION:

FY94 specific accomplishments: (a) development and demonstration of miniature display and helmet-vehicle interface technologies for helmet-mounted tracker and displays (HMT/Ds) by: 1) defining alternative design requirements for new HTM/D for fighter aircraft; 2) developing miniature cathode ray tube (CRT) technology optimized for use on HMT/Ds; and 3) demonstrating standardized helmet-vehicle interface (HVI) for

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binocular HMT/Ds in ejection seat equipped aircraft; and (b) demonstration of the utility of 3-D audio localization and high off-boresight angle (HOBA) missile seekers using HMT/D technology on operational aircraft by: 1) demonstrating target acquisition with high off-boresight angle (HOBA) missile seekers using an HMT/D on two F-15C aircraft; 2) demonstrating utility of 3-D audio localization of AV8B and OV-10 aircraft; and 3) developing an improved set of flight qualified display electronics.

PROGRAM ELEMENT OVERVIEW

PE: 0604227F TRAINING SYSTEMS DEVELOPMENT

FUNDING: FY95 $ 13.7M (FY96 PRESIDENT'S BUDGET)
                                  FY96 $ 8.8M (FY96 PRESIDENT'S BUDGET)

PE SYNOPSIS:

The objectives of this Program Element are to adapt simulation technology
and standards developed in the laboratories and industry to satisfy MAJCOM
training requirements, and to develop prototype training devices.

Project 3135, Advanced Training System (ATS) will be transferred to Program
Element 0604243F (Manpower, Personnel, and Training) as of FY96. FY96 and
FY98 funds will transfer with the program and become Project 4369, Air
Education and Training Management System.

Funds for FY99 and outyears will remain in Program Element 0604227F,
Project 2325, Simulator Development Activities.

RELATED ACTIVITIES:

There is no unnecessary duplication of effort within the Air Force or the
Department of Defense.

PAYOFF/UTILIZATION:

This is a continuing Program Element for the development of aircrew and
maintenance training techniques and devices. This Program Element is
devoted to the Engineering and Manufacturing Development (EMD) of aircrew
and maintenance training systems, and is, therefore, included in Budget
Activity #5 (EMD).

PROJECT OVERVIEW

	95	96

PROJECT: 2325   SIMULATOR DEVELOPMENT $1.8M $1.7M
ACTIVITIES

PE: 0604227F   TRAINING SYSTEMS DEVELOPMENT

CONGRESSIONAL CATEGORY: TRAINING SYSTEMS

PROJECT SYNOPSIS:

The objectives of this Project are to: a) provide funds to conduct engineering development of new aircrew/maintenance training technologies and standards; and b) fund the pre-production of first article training devices to satisfy the customer's training requirements.

Research efforts currently planned or underway include using artificial intelligence techniques in the development of a generic Intelligent Training Management System (TMS). Structural Modeling (SM), a set of software templates and corresponding specification forms for developing training device software, will also be developed.

FY95 plans: a) complete development of the Structural Modelling (SM) core architecture, and continue support of programs using SM; b) continue development of objective measures for the transfer of training from the simulator to the aircraft; c) start evaluation, integration, and documentation of the latest training technologies (SMART 2000); d) complete peripheral vision testing; and e) provide technical support.

FY96 plans: a) continue development of objective measures for the transfer of training from the simulator to the aircraft; b) continue evaluation, integration, and documentation of the latest training technologies (SMART 2000); and c) begin development of a prototype training system for demonstrating the latest training system technology (SMART 2000).

PAYOFF/UTILIZATION:

FY94 accomplishments: a) for Structural Modeling (SM), continued support of Special Operations Forces Aircrew Training System, Simulator for Electronic Combat Training, and F-22 programs, as well as development of an SM test bed and core architecture; b) the Intelligent TMS expansion of the scheduling engine into a complete scheduling module, to be integrated into and tested with an existing TMS; c) initial testing to determine the acuity of peripheral vision under dynamic conditions of Espirit Visual System; and d) determination of tradeoffs between Area Of Interest (AOI) size and resolutions, blend region, and latency requirements of visual systems using the Espirit Visual System.

PROJECT OVERVIEW

	95	96

PROJECT: 2769   SIMULATOR UPDATE $3.6M $3.2M
                  DEVELOPMENT/SIMULATOR
                  REQUIREMENTS DEFINITION

PE: 0604227F   TRAINING SYSTEMS DEVELOPMENT

CONGRESSIONAL CATEGORY: TRAINING SYSTEMS

PROJECT SYNOPSIS:

The objective of this Project is to provide critical Training System
Product Group (TSPG) support funding for multiple user command products to
include F-16 Weapon System Trainer, B-1B conventional upgrades, Simulator
for Electronic Combat Training (SECT), C-17 training suite, Universal
Training Device, and C-141 Aircrew Training System. These support systems
include a computer center, communications, Systems Engineering and
Technical Assistance (SETA) contracting, travel, supplies, specialized
training, and equipment.

Initiatives are identified and funded through this Project to modify and
upgrade existing training systems. Project 2769 funds initial and
continuing development activities such as development of C-130H maintenance
training devices and Undergraduate Air Weapons Controller Training (UCT).

Project 2769 is also used to: a) define requirements for new training
systems in the form of tasks to be trained (this supports a Milestone 0
decision); b) develop options to meet the requirements (this supports a
Milestone 1 decision); and c) build a prototype of one or more of the
options to evaluate the training effectiveness of those options.

FY95 plans include the initial examination of Distributed Interactive
Simulation (DIS) retrofits to Air Force simulators.

FY96 plans include the continued examination of DIS retrofits to Air Force
simulators.

PAYOFF/UTILIZATION:

FY94 specific accomplishments: a) application of aircrew training concepts
to Air Combat Command aircraft; b) initial implementation of DoD
Instruction 1322.20 across the Training Systems Division; and c) initial
development of updates for C-130 maintenance training devices.

PROJECT OVERVIEW

	95	96
PROJECT: 3000 KC-135 AIRCREW TRAINING SYSTEM	$0.1M	$1.4M

PE: 0604227F   TRAINING SYSTEMS DEVELOPMENT

CONGRESSIONAL CATEGORY: TRAINING SYSTEMS

PROJECT SYNOPSIS:

The objective of this Project is to develop aircrew training devices and courseware for the KC-135E, KC-135R, and C-135B aircrew members, including Air National Guard (ANG) and Air Force Reserve (AFRES) components to satisfy continuation training requirements. Replaces current "blue suit" instructors with contractor instructors.

FY95 plans are to continue Mission Support for the project.

In FY96 plans are to: a) develop a replacement for KC-135 Weapons System Trainer (WST) navigation prototype station due to KC-135 WST elimination; and b) continue Mission Support.

PAYOFF/UTILIZATION:

FY94 specific accomplishments included full Mission Support.

PROJECT OVERVIEW

	95	96

PROJECT: 3135   ADVANCED TRAINING SYSTEM $1.4M $0.0M
(ATS)

PE: 0604227F TRAINING SYSTEMS DEVELOPMENT

CONGRESSIONAL CATEGORY: TRAINING SYSTEMS

PROJECT SYNOPSIS:

The objectives of this Project are to: (a) free instructors for individualized instruction in complex, highly-technical tasks; (b) promote efficient training; and (c) provide rapid course creation and updating.

ATS supports instructional development, delivery, evaluation, and resource management at Air Education and Training Command's Technical Training Centers. Commercial hardware and software will yield a reliable and easily maintainable system.

Project 3135, ATS, will be transferring to the Air Education and Training Management System (AETMS) project in PE 0604243F, Manpower, Personnel, and Training as of FY96. FY96 to FY98 funds will transfer with Project 3135 and become Project 4369, Air Education and Training Management System. Funds for FY99 and outyears will shift to Project 2325, Simulator Development Activities.

PAYOFF/UTILIZATION:

This Project will be completed under this Program Element at the end of FY95.

PROJECT OVERVIEW

		95	96
PROJECT: 4022	SIMULATOR FOR ELECTRONIC COMBAT TRAINING (SECT)	$6.8M	$2.5M

PE: 0604227F   TRAINING SYSTEMS DEVELOPMENT

CONGRESSIONAL CATEGORY: TRAINING SYSTEMS

PROJECT SYNOPSIS:

The Simulator for Electronic Combat Training (SECT) will replace outdated simulation devices that support Electronic Warfare Officer Training. The simulator will train students in basic threat recognition and associated electronic combat procedures in a simulated airborne environment. This training is possible only with simulation due to environment, security, and range restrictions.

FY95 plans: (a) begin in-plant test of the system; (b) begin complete system code/unit test; and c) complete system design and hardware/software integration.

FY96 plans: a) deploy and complete on-site test of system at Corey Station, NTC, FL; and b) complete hardware/software integration.

PAYOFF/UTILIZATION:

FY94 specific accomplishments: (a) completed Critical Design Review (CDR) Readiness Assessment; (b) completed CDR; and c) began system design and hardware/software development/integration.

PROGRAM ELEMENT OVERVIEW

PE: 0604243F MANPOWER, PERSONNEL, AND TRAINING DEVELOPMENT

FUNDING: FY95 $ 4.5M (FY96 PRESIDENT'S BUDGET)
                                  FY96 $ 5.3M (FY96 PRESIDENT'S BUDGET)

PE SYNOPSIS:

This program is in the research category/budget activity Engineering and
Manufacturing Development (EMD) as it provides engineering development to
Manpower, Personnel, and Training (MPT) technologies to improve the
effectiveness of Air Force (AF) training development/delivery, performance
assessment, personnel acquisition, job assignment, force management, and
human performance in weapon systems. MSTs are designed to leverage senior
maintenance personnel experience, through the use of artificial
intelligence, for use in training juror specialists. AETMS will be the
major Air Education and Training Command (AETC) training system with
emphasis on centralized training focus for a decentralized training
environment. AETC will benefit from more standardized training command
wide. Acquisition strategies are covered under individual projects.

The in-house managing organization responsible for this program is the
Human Systems Center, Brooks AFB, TX.

RELATED ACTIVITIES:

Related activities for this Program Element include: Program Elements
0602205F, Personnel, Training, and Simulation and 0603227F, Personnel,
Training, and Simulation Technology.

There is no unnecessary duplication of effort within the Air Force or the
Department of Defense.

PAYOFF/UTILIZATION:

The payoffs anticipated from this Program Element include improved
effectiveness of AF training development/delivery, performance assessment,
personnel acquisition, job assignment, force management, and human
performance in weapons systems.

PROJECT OVERVIEW

	95	96

PROJECT: 3818   MAINTENANCE SKILLS $4.5M $4.3M
TUTORS (MST)

PE: 0604243F   MANPOWER, PERSONNEL AND TRAINING DEVELOPMENT

CONGRESSIONAL CATEGORY: TRAINING SYSTEMS

PROJECT SYNOPSIS:

The Maintenance Skills Tutors (MST) will field multiple computer-based tutors for the Combat Air Forces and other Air Force agencies to improve training of complex skills for a broad range of Air Force jobs; primarily aircraft maintenance troubleshooting. These MST's may include some initial skills training, but primary emphasis will be on the more difficult cognitive skills such as understanding and troubleshooting problems that the maintenance-aiding equipment and systems are unable to diagnose. Four of the initial Air Combat Command (ACC) tutors will be fieldable test/research assets developed by Armstrong Lab under the Basic Job Skills (BJS) program. The System Program Office (SPO) is developing two tutors as a pre-EMD cost and schedule risk reduction effort. This effort was approved by the Designated Acquisition Commander (DAC), HSC/CC, with support from our user, ACC/LG. The core tutor software models from this effort will be reused for the remaining five tutors. The last five tutors will be developed under EMD.

FY95 plans: a) complete development, begin operational evaluation and fielding of the F-16 flightline Avionics A and C shop tutors; b) begin cognitive task analysis for the F-16 flightline Avionics B shop tutors; c) begin operational evaluation and fielding of two F-15 flightline avionics tutors and two F-15 flightline pneudraulics tutors; and d) begin evaluation of tutors authorizing package options.

FY96 plans: a) complete operational evaluation and upgrade of F-15 and F-16 avionics tutors; b) complete development and begin operational evaluation and fielding of F-16 flightline Avionics B shop tutors; c) begin development of F-16 Tactical Aircraft Specialist (TAMS) I tutor, collect Cognitive Task Analysis (CTA) data and begin S/W design; and d) begin evaluation and modification of Rapid Intelligent Tutor Development System (RIDES) and continue other tutor authoring software.

PAYOFF/UTILIZATION:

FY94 specific accomplishments: a) continued development of F-16 Avionics A and C shop tutors; b) modified and fielded F-15 avionics intermediate shop tutor; and c) evaluated alternative tutor capabilities.

PROJECT OVERVIEW

		95	96

PROJECT: 4369   AIR EDUCATION AND $0.0M $1.0M
                       TRAINING MANAGEMENT
                       SYSTEM (AETMS)

PE: 0604243F MANPOWER, PERSONNEL AND TRAINING DEVELOPMENT

CONGRESSIONAL CATEGORY: TRAINING SYSTEMS

PROJECT SYNOPSIS:

The Air Education and Training Management System (AETMS) expands the
Advanced Training System (ATS) to support Technical Training and
Professional Education at all AETC training activities, providing a single
command wide training development, delivery, and management system.
Commercial hardware and software will yield a reliable and easily
maintainable system. AETMS will build upon the existing ATS and other
commercial/newly developed software, simplifying development. This project
was generated in the transfer of the ATS project from PE 0604227F, Training
System Development, beginning in FY96. Acquisition strategy for AETMS
contractor development activities will be awarded through full and open
competition.

This Project is a new start in FY96.

FY96 plans: a) complete software redevelopment of portions of ATS for
technical training; and b) initiate software development to incorporate
Professional Education functionality.

PAYOFF/UTILIZATION:

This Project is a new start beginning in FY96.